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## ORIGINAL COMMUNICATIONS.

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### THE ESSENTIALS OF VOICE PRODUCTION.*

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I wish to assure you that I much appreciate the honor you have done me in inviting me to prepare a paper for this meeting, in spite of the fact that I have long been out of the ranks of practising laryngologists.

I was led to enter on my short career as a laryngologist almost entirely from a love of a study of the voice, and the desire to be of assistance to those who use the voice in public. As a matter of fact, such persons constituted the majority of my patients. Having, from the age of sixteen, made a practical study of voice production, and worked out many results wholly by experiment on myself unbiased by the theories of others, I was in a position to judge of the causation of many of the troubles for which speakers and singers came to me, though sometimes I went to hear some of these patients speak in public purely for my own satisfaction that I might be the more sure on the question of causation.

My interest increased, I began to read all I could lay hands on that bore on the subject of voice production—and I must say I never misspent the same amount of money on other books as on those bearing on the voice, as it was treated twenty years ago by others than physiologists and laryngologists, speaking generally. Being enthusiastic and determined to know the truth, I carried out some laborious investigations, and practiced auto-laryngoscopy industriously, and I think very profitably. Up to the present hour my interest has kept increasing, especially as I have always been a practical musician, and music is to me as daily bread. I have

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preferred to give you a little of my own history rather than to attempt to prescribe what shall be the attitude of the laryngologist to this subject, so far as his own studies are concerned.

That his patients will appreciate real knowledge of the voice, my experience gives ample warrant, but to influence them much he must show a sympathy with and some knowledge of music—sound as far as it goes. He may choose to say nothing to his patients that bears on the subject of voice production—he may simply draw his own conclusions as to the method of the speaker or singer after the necessary inquiries as to his teachers and methods, or he may take a bold stand and feel it his duty to prescribe a change as to both. Were I myself to again return to the practice of laryngology, I suspect that I would often do both, though aware that this might not put money in my purse. It produces in my mind an indescribably wretched feeling to know that the methods a young person of a naturally good voice and sound vocal organs is pursuing must inevitably lead to the ruin of that voice. In such a case there would be for me but one course to take. I do not prescribe for others.

In dealing with the essentials of voice production, I think your confidence in what I have to say may be largely in proportion to the fewness of the principles on which I insist as essential. When one reads or hears accounts of the "methods" of teachers and finds that they differ, or seem to differ so much, one naturally asks: "Whom of all these professed experts are we to believe?"

Oliver Wendell Holmes held that the medical was the most sensible of the professions, so I presume that if I am to prove worthy of your confidence, I must so present what I consider either as essential or very important in such a way that it shall at least seem sensible.

I remember when a youth hearing a man of considerable attainments and ability say that he could tell all he knew about any subject in five minutes. This statement caused me to marvel then, but it is not so mysterious now. Although I have been studying the subject theoretically and practically all my life, I feel satisfied that I can state all the essentials in five minutes or less. Such statements might, however, be so imperfectly comprehended that they would serve no enlightening purpose. But just to put the matter in this brief form for the moment, I should say that to realize that speaking and singing are in essentials the same—that physiological adjustment of the various parts of the vocal or-

gans is the keynote of the whole—that practically all respiration exists for the expiratory blast—that the principal adjustment is between the expiratory action of the respiratory mechanism and the vocal bands, known as "the attack"—that this is completed by a further adjustment of the upper or resonance chambers to the parts below—that one speaks with the tongue—that one must on no account speak with the throat—that he must speak from the throat into the resonance or upper chambers—that is, he must speak towards his face—that he must especially speak and sing with that part of his mouth cavity lying between the soft palate and the teeth—that he must keep the back of the throat and the front boundaries of the mouth cavity out of the way—that he must never strain or use more force in phonating than the organs can bear without suffering—that artistic speaking and singing are always physiological—that vowels alone are musical, and that consonants are nuisances, necessary and deserving of close attention.

Having said this, what remains further to be said that is really vital? Now, perhaps, I cannot do better than attempt to illustrate, as I would do to a body of intelligent medical students who had completed their second year, and who were at once musical and interested in the voice. I think I should say to them:

That the key to the understanding of respiration is to remember the great importance of the diaphragm and the lower chest;—that the key to the complex movements of the larynx is found in the relations of the vocal bands to the arytenoid cartilages, the analogy to the universal-joint-action of which is especially to be borne in mind.

Most voices, especially in America, are somewhat lacking in resonance. It is important, therefore, that the student of the voice understand this subject, and I find some such simple illustrations as the following at once interesting, easily remembered and convincing. (At this point a violin, with and without a mute, an imitation violin and a cylinder and tuning fork, were used to illustrate resonance. The speaker's voice was also employed to make some points clearer, and certain principles were expanded by additional remarks.)

The fact that vowels alone are musical, and that consonants cannot but be the reverse, follows from the simple fact that the former all call for the open mouth, and the latter all close the mouth, more or less, and interrupt the breath stream. Vowels

are learned first; the infant cries on a vowel sound, and consonants come later—a hint to teachers of voice production.

Many persons in their zeal for good consonantal utterance forget that there is danger in dwelling on the initial consonant of a word, the effect of which may be to keep the mouth too long closed, or to leave it imperfectly opened on the vowel, so that I urge that the voice student bound off the initial consonant, and get the mouth open on the vowel. This is especially important for the singer who prolongs sounds to a much greater extent than the speaker. Indistinctness does not usually arise through inattention to the initial consonant of a word, but to the final one; and in a large building it is better for the speaker to dwell only moderately on final consonants, and to make frequent and somewhat lengthy pauses so that the listener may be enabled to hear not only the last word, but to grasp the entire phrase, and not feel himself under constant tension in order to follow the speaker at all.

It is much to be regretted that speakers are not equally convinced with singers of the importance of the study of technique, or in other words the movements of the vocal organs necessary to the best results. An enlightened singer thinks it necessary to spend years in acquiring technique, but any such conviction on the part of a speaker is of the rarest, and with corresponding results.

The time was when a man could go to the theater and hear our noble English tongue nobly uttered, but that is only a memory. Where are the Booths, the Macreadys, the Modjeskas of to-day? Although the American nation excels perhaps all others in the amount of energy it puts forth, it is positively lazy and indifferent as regards utterance. The negro is proverbially indolent, and his speech corresponds to his nature. In some cases his consonants are all but non-existent; but many white people make fairly good seconds to the negro in this respect, and the nation from one end to the other, and Canada must be included in this indictment, is given to nasality, owing to the laziness that allows the tongue to roll up and back, and the soft palate to drop and meet it, so that the breath stream must pass through the nose.

Thus bad utterance is so common that it is little noticed, indeed, almost anything passes even with educated people, among us so long as it be not ungrammatical. There is an almost universal vitiation of taste as regards vocal utterance, and an equally widespread indifference—and I only refer to what you all know in

the hope that we may be more fully resolved to set our faces against this, and to cry out for reforms which must begin in the home and in the school.

I lay great stress myself on exclusive mouth breathing in phonating. Some have made a fetish of nose breathing because it is "natural." It is, under ordinary circumstances—but speaking and singing are only natural processes in a secondary sense. The lower animals do not employ them, nor does man do so all the time. In mouth breathing the tongue flattens, and the soft palate tends to rise, and the totality of the mouth parts are put into the best form for the utterance of pure vowel sounds. Nasality becomes almost difficult under such circumstances, while in the absence of mouth breathing it is very difficult of cure.

There is no real objection to mouth breathing, except when the atmosphere to be inhaled is either very cold or very impure. It is not to be adopted for outdoor speaking. I find that it greatly facilitates good results in both singers and speakers, although in some instances bad habits can only with great difficulty be overcome, if nasal breathing be employed.

It will be seen then that the whole question of good voice production hinges on physiological adjustments of a certain kind, so that there is economy of energy and ease on the one hand, and pure tones on the other. Nearly all faulty methods tend to produce venous congestion with a corresponding starvation and poisoning of the tissues of the vocal organs, owing to the simple fact that the blood is kept too long in the capillaries. One may say that all proper use of the voice is physiological, while all methods giving bad artistic results are physiologically unsound.

This is another way of saying that one part of Nature is not in antagonism with another part. Good speaking or singing is at once natural and unnatural. Unnatural because it is never attained by the untrained man—natural because the processes must be in harmony with the laws of the body and the mind.

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# THE DRAINAGE MECHANISM OF THE NORMAL ACCESSORY SINUSES.*

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With the exception of a few sentences scattered here and there through the literature, little has been written upon the subject of the drainage of the normal accessory sinuses. This drainage is dependent upon certain physical and physiological laws, which it is the object of this communication to place before you for consideration and discussion, in the belief that a fuller knowledge and understanding of the normal drainage mechanism of the nose will help materially in solving some of the difficult problems.

Although the nose secretes daily several pints of sero-mucous fluid, only a small portion of the fluid comes from the accessory sinuses. In the nasal passages this fluid disappears by evaporation; but as the conditions for evaporation are not favorable within the sinuses, it follows that the secretion of the sinuses must be discharged into the nose. The fact that the sinuses are thus capable of draining themselves when they are in a normal, healthy condition will hardly be disputed; but that they are also capable of emptying themselves through their natural orifices when they have become diseased may not be so self-evident. Yet it is within our experience that acute inflammations of all the accessory sinuses have a natural tendency to get well without operative interference, the end of the disease being marked by a discharge of secretion into the nose, lasting for days or weeks, during which time drainage through the natural orifices goes on without interruption; so that even when the mucous membrane is diseased and the quality of the secretion altered, drainage through the natural orifices is possible, and in a large percentage of the cases is sufficient. We may, therefore, assume that in these cases the normal drainage mechanism has not been destroyed, and by following the course of the secretion in these cases some light is thrown upon the mechanism of normal drainage.

The first factor to be considered is drainage by gravitation. By this term I mean the direct outflow of the secretion by virtue of its weight. A fluid collecting in an accessory cavity naturally seeks to follow the law of gravitation, and to collect in the lowest part

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of the cavity. It cannot flow out of the cavity until its level reaches the level of the natural opening, or until the position of the head is changed so as to bring the natural opening below the level of the fluid.

The opening of the antrum is situated near the upper part of its internal wall. Hence, secretions cannot flow out of this orifice, in the upright position of the head, until the antrum is nearly full of fluid. The lower half of the antrum, however, is larger in volume than the anterior half, so that an accumulation of fluid, which is not high enough to reach the natural orifice in the upright position, may escape through this opening when the head is bent forwards. Complete emptying of the sinus can only take place when the head is bent toward the opposite side.

In the case of the frontal sinus, the opening is favorably situated when the individual is in the upright position, or when he lies upon the opposite side; but even when the naso-frontal duct is typical in arrangement, the drainage by gravitation is obstructed by the long and narrow passage through which the fluid must pass. This is equally true when the fluid must first pass through an ethmoid cell.

The anterior ethmoid cells open into the hiatus semilunaris, or between the bulla and the middle turbinate, each, according to Hajek, by a separate opening. This opening is sometimes situated near the floor of the cell, sometimes high above the level of the floor; but there are many deeper cells which open into each other and into the superficial cells in a variable manner, so that there is no position of the head in which the ethmoid labyrinth can completely empty itself. The posterior ethmoid cells are similarly situated, in reference to their outlet.

The opening of the sphenoid sinus is at the upper and outer part of its anterior wall, so that fluid can flow from this sinus only when the head is bent forward or toward the same side.

It is, therefore, evident that there is no single position of the head which is favorable to drainage from all the sinuses. During sleep, drainage from one-half of the sinuses would be favorably affected if the individual rest upon the side. During waking hours, in the occupation of most individuals, the position of the head varies sufficiently to cause frequent changes in the position of the fluid in the sinuses, and in this way the drainage of one or another of the sinuses may be temporarily affected in a favorable manner.

On the other hand, even when the head happens to be in such a position that the natural orifice of any particular sinus is at its

most dependent portion, the escape of any contained secretion can, at best, be only slow and intermittent. For, when a liquid flows from a vessel with a narrow outlet, it escapes in jets. Each jet is followed by the entrance of a bubble of air into the vessel. If the surface tension of the liquid is low, the jets and bubbles follow each other in rapid succession; but if the liquid is thick and viscid, like glycerin, for instance, or like the nasal secretions, its escape will be very slow; in fact, if the opening is very small, there may be no escape of liquid at all.

Now, there is but one small opening into each sinus. Hence the escape of secretion from the sinuses is slow, each drop being succeeded by an intermission, during which a bubble of air enters the sinus. In persons who have excessive secretion in their sinuses, this bubble of air may give rise to a sensation, or to a noise of which the individual is distinctly conscious.

Considering these facts, and bearing in mind that the secretion of the healthy sinuses is a mucous fluid, and that of the diseased sinuses a still more viscid one, it is evident that gravitation, as such, plays a very small part in the drainage of the normal accessory sinuses, as well as in the drainage of those diseased cavities in which restoration to health takes place without operative interference. On the other hand, the explanation of the manner in which these cavities *are* drained, must be sought in a study of the character of the mucous membrane over which this drainage takes place, and of the physical properties of the secretion.

With the exception of the olfactory tract proper, the mucous membrane of the nose and its accessory cavities is covered with ciliated epithelium. The cilia are in a state of constant motion, which has been compared to the lashing of a whip. Each cilium moves through an arc of from 20 to 30 degrees, at the rate of about 12 times per second, the forward movement being about twice as rapid as the return movement. All the cilia of a single cell move in the same direction at the same time, but the cilia of all the cells do not move simultaneously, but the motion is carried over the mucous membrane in a wavelike manner. The movement of the cilia is maintained and governed by the nucleus of the cell. It is favored by heat, by a proper degree of fluidity, and by an alkaline reaction of the secretions; it is retarded by cold, by dryness, by viscidity of the secretions, and by various chemical reagents. The direction of the ciliary motion is always toward the external orifices of the body; in the accessory cavities it is toward their natural

orifices. The power exerted by the combined action of the cilia is said to be very considerable.

By means of this ciliary motion, the secretion covering the mucous membrane is kept constantly moving toward the natural openings and into the nasal passages. Ciliary activity is therefore an important factor in maintaining the drainage of these cavities. The fact that diseases, in which the cilia are destroyed, such as the various forms of atrophic rhinitis, are frequently associated with accessory sinus diseases, would be an instance.

In some of the sinuses, and in favorable positions of the head, the activity of the cilia is in a downward direction, and is favored by gravitation; but in other sinuses, and in many positions of the head the fluid must be driven uphill, and in such cases the upward motion of the fluid is favored by the fact that the secretion is exuded from all parts of the mucous membrane in small quantities at a time. For some of the secretion is exuded near the natural orifice, so that the distance which it must be moved is small; but this fact also brings into play a certain law of physics, as follows: When a fluid is present in large quantities the law of gravitation prevails, and the fluid flows downwards; when the quantity of fluid is small, so small that it is measured in drops, its gravity may be counteracted or even overbalanced by other properties, such as adhesion, surface tension or tenacity, capillary attraction and syphonage. These physical properties are common to all fluids alike; they are therefore true of the secretion of the normal sinuses, and of the diseased sinuses as well. Their influence in determining the drainage of the sinuses has not been touched upon in the text-books nor in other literature. We have, therefore, collected the results of clinical observation of these phenomena, and will present them in the order in which they seem to exert their action in the nose.

By adhesion we mean the power of attraction existing between bodies. Not every liquid can adhere to a solid, as, for instance, mercury and glass; when, however, adhesion between a liquid and a solid exists, as between water and glass, the liquid is said to have the power of wetting the solid. If a drop of liquid is placed upon a surface which it is capable of wetting, it does not remain stationary, but spreads over the surface; if the surface be vertical, it will rise upwards, contrary to the direction of gravitation, as well as downwards; this creeping of the fluid takes place more readily if the surface has been previously wetted with the liquid, for when it is dry, the adhesion of the

atmosphere to the solid must first be overcome. In consequence of this power, a liquid contained in a vessel which it moistens, will rise along the sides of the vessel, so that the upper surface of the liquid is not flat, but is concave, presenting what is familiarly known as the meniscus. The height of the meniscus depends upon the degree of adhesion existing between the liquid and its container, and is greater when the surface of the container has been previously moistened with the liquid.

Now, in the nose the adhesion between the secretion and the surface of the mucous membrane is very great, for one of the main functions of the secretion is to keep the mucous membrane moist. Any secretion formed in the sinuses therefore tends to spread over the walls of the sinus. If secretion has accumulated within one of the sinuses, its surface will present a high meniscus, so that the level of the fluid where it comes in contact with the walls of the sinus will be much higher than in the middle, and the actual dimensions of the sinuses are such that the height of the meniscus is generally sufficient to bring the fluid up to the level of the natural orifice. In like manner the secretions rise out of the various depressions and pockets in the floor of the sinuses, and are able to surmount the obstructions presented by the partitions and septa which are often encountered. The rise of the meniscus is favored by the cilia; for the area of the mucous membrane is greatly increased by these numerous projections from its surface, and consequently the adhesion is greater. Moreover, as the direction of the ciliary motion is toward the natural orifice, the two forces always act in unison to bring the fluid to the outlet of the sinus.

If a liquid is contained within a tube the surface of which it can moisten, and whose diameter is sufficiently small, the adhesion of the liquid will overcome its gravity, and instead of flowing out of the tube, the liquid will rise in the tube contrary to the direction of gravitation. This phenomenon of capillary attraction is directly dependent upon adhesion and is subject to the same laws. In a tube of given diameter the height to which the liquid will rise depends upon the degree of adhesion between the liquid and the tube. With a given liquid and tube, the capillary attraction depends upon the diameter of the tube, the narrower the tube, the higher the liquid will rise. It is not necessary, however, that the capillary space be tubular in form; for these phenomena will manifest themselves equally well between any two surfaces which are near enough

to each other. If the surfaces are parallel to each other, the liquid will rise to a certain height and its upper border will be horizontal. As the height to which the liquid will rise depends upon the distance between the surfaces, it follows that in a wedge-shaped space, the liquid will rise higher along the narrow side of the wedge. In fact, in a horizontal wedge-shaped space which is open below, a drop of fluid introduced into the open part of the space, below, will flow upwards until it forms a narrow band along the line where the surfaces meet. Capillary attraction is always greatest in the immediate neighborhood of points of contact.

Now, as soon as the secretion of the sinuses reaches the natural outlet, it encounters the capillary attraction due to the conformation of the outlet. The outlet of the frontal sinus is tubular in form; in this form the capillary force is greatest, and it is by virtue of this fact that the resistance due to the unusual length of the naso-frontal duct is overcome. The orifices of the antrum and of the anterior ethmoid cells, as well as the naso-frontal duct, open into the semilunar hiatus, a narrow space with parallel walls, which exerts a not inconsiderable degree of capillary suction upon the secretion which presents itself in these orifices. The sphenoid sinus and the posterior ethmoid cells open into the very narrow superior meatus, whose walls are sufficiently close together to exert similar attraction upon their secretion.

When the semilunar hiatus is visible, the secretion may be seen; for it accumulates in the wedge-shaped space formed between the rounded edges of the lips of the hiatus. The secretion does not necessarily accumulate in the lower part of the hiatus, but flows readily along its entire length, quite independent of gravitation. By virtue of its adhesion and its power of spreading over the moist surface of the mucous membrane, it flows downwards over the uncinate process and upwards over the bulla, and will next be found accumulating in the wedge-shaped space or groove between the uncinate process and lower turbinal, or between the bulla and middle turbinal. In this way the secretion is spread over the entire surface of the middle meatus, and as this is the main respiratory channel, the secretion will, if its quantity is not excessive, disappear by evaporation. On the other hand, when the quantity of secretion is excessive, its further course is of interest. If the middle turbinal is large, the space between it and the outer nasal wall, and between it and the lower turbinal, becomes a capillary space. Owing to the rounded outline of the turbinals, this space is a wedge-

shaped space, the angle of the wedge becoming more acute above. As the secretion must follow the law of capillary attraction and accumulate in the narrowest part of a wedge-shaped space, it will sometimes happen that the only visible accumulation of secretion will be found high up in the angle between the middle turbinal and the agger nasi. The fact that secretion is present in this locality, and that it reaccumulates here after it has been wiped away, does not indicate that it comes from the frontal sinus, for it may reach this locality from the antrum as well as from the frontal sinus. It is only when the space between the middle turbinal and the outer nasal wall is so large that capillary attraction between them is impossible, that the location of the secretion is of value in the differential diagnosis between the sinuses of the anterior group; for, under these circumstances, the secretion from the frontal sinus is apt to accumulate in the anterior part of the middle meatus, that from the antrum in the posterior part.

The secretion of the sphenoid sinus is apt to flow into the nasopharynx; but it usually flows, together with the secretion from the posterior ethmoid cells, over the middle turbinal into the olfactory fissure. The mere presence of secretion in this region, however, is not pathognomonic of diseases of the posterior group of cells. For the secretion from the anterior group, which is drawn by capillary attraction to the outer surface of the middle turbinal, may accumulate along the edge of this structure in the form of a hanging drop or band. The secretion is not limited, however, to this hanging drop or band alone; for upon closer examination it can be seen that a thin film of secretion extends upwards on both sides of the turbinal, having been drawn up into this position by virtue of its wetting power, i. e., by adhesion. The thin film corresponds to the meniscus in a hollow space or cavity. If, now, the middle turbinal is in contact with the septum, or near enough to it to enable the drop of secretion to bridge the gap, the secretion will be readily drawn up into the angular space between the two structures, according to the law of capillarity which has been quoted. The presence of secretion in this region is, therefore, pathognomic only when disease of the anterior group has been excluded, or when the secretion can be seen in the superior meatus by posterior rhinoscopy.

The secretion which flows from the hiatus semilunaris over the uncinate process reaches the inner surface of the lower turbinal, and may accumulate along its lower border and reach the septum in the same manner as described above for the middle turbinal. From

both turbinals the secretion of the entire nose is carried over to the septum, along which it can easily flow down to the nasal floor, to be discharged from the nose.

Between the two turbinals and the septum there is a triangular space, around the edges of which secretion is held by capillary attraction; but in many individuals this space is filled up by a slight elevation, thickening or spur of the septum, which converts this triangular space into a space with parallel walls, so that capillary attraction is equalized over this area. Such a slight elevation of the septum in this region may, therefore, be an aid to drainage, and its removal a distinct detriment.

It is evident from the above facts that the nasal passages may be regarded as a series of capillary spaces, which are in direct communication with the sinuses through the natural orifices, and that the secretion which lies in these capillary spaces is in direct continuity with the secretion which lies within the sinuses. It therefore follows that when the secretion which has entered the nasal passages through one of the natural openings, has reached as far down as the level of the fluid within the sinus, a new factor in drainage is called into play, namely, syphonage; for under these conditions, the weight of the fluid within the sinus is balanced by the weight of the fluid in the nasal passages. As the capillarity of the nasal passages is exerted between the turbinals and the septum, its effects must be co-extensive with these structures. Hence, as the area of the septum is very great, both in height and in length, especially in comparison with the corresponding dimensions of any one of the sinuses, the nasal passages must be considered as the long arm of the syphon, which has several short arms, each represented by one of the sinuses. The fact that the combined area of the sinuses is much greater than that of the septum and nasal passages does not enter into consideration at all; for syphonage depends upon the relative pressure in its two arms, and is independent of the number of vessels which may feed the syphon. When the amount of secretion is normal, the effect of syphonage upon each sinus is the same as if the other sinuses did not exist. When, on the other hand, the amount of secretion in one sinus is excessive, the increased volume of fluid may choke the long arm of the syphon, i. e., the nasal passages, and interfere with the flow from the other sinuses. The secretion may even back up into another short arm of the syphon, i. e., into another sinus, and so we note the clinical fact that when one sinus is diseased the others are endangered. The po-

sition and shape of the natural orifices have no effect upon syphonage; for the natural orifice corresponds to the bend of the syphon, and it is quite immaterial whether it happens to be high or low, angular or rounded. Syphonage is independent of the position of the head; for the area of the septum is so great that it is equally effective in every position.

In order to maintain the efficiency of the syphon, it is necessary that the continuity of the fluid from within the sinus, through the natural orifice and into the nasal passage be unbroken. This continuity is favored by the tenacity of the secretion, which is supplied by its mucous constituents. A break in the continuity of the fluid, and a consequent interruption of the syphonage, may undoubtedly occur from various causes, but in the healthy nose such a break would be readily repaired by the activity of the cilia; for the direction of the ciliary movements corresponds exactly to the direction of the syphonage.

It has been supposed that ordinary quiet respiration aids the drainage of the sinuses by exerting a suction action during inspiration, the return of the fluid being prevented by a valve-like action of the semilunar hiatus. This theory would leave out of account entirely the posterior group of sinuses, as very little air passes through the superior meatus during quiet respiration.

It has also been supposed that expiration empties the sinuses in a way similar to the manner of emptying the middle ear by politzerization. That the ordinary movements of quiet respiration have no such effect may be proven by the observation that during quiet respiration a drop of mucus held in any of the capillary spaces of the nose, executes only a very slight to and fro movement. On the other hand, forced expiration, as in sneezing and blowing the nose, and forced inspiration, as in the act called sniffling, act very powerfully to clear the nose of accumulated secretion, and by keeping the long arm of the syphon clear, aid in maintaining proper drainage. In like manner swallowing, gagging and gargling, by causing a reflex contraction of the superior constrictor of the pharynx, help to keep the posterior nares and naso-pharynx clear of secretion.

Atmospheric conditions have a marked effect upon the state of the nasal mucous membrane, and hence exert a secondary influence upon the drainage of the sinuses. The inhalation of cold and dry air causes a swelling of the venous channels, both upon the turbinals, and upon the septum, thus narrowing the respiratory

channels, in order to expand, warm and moisten the inspired air. Under these conditions the outlets of the sinuses may become obstructed, and so we find that cold weather favors the occurrence of acute sinus affections, as well as exacerbations of chronic affections. When the atmosphere is warm and contains the proper amount of moisture, this engorgement of the mucous membrane disappears. This physiological reaction of the turbinals to changes in the surrounding atmosphere is very prompt, and is effected through the agency of the vaso-motor nerves.

By accentuating the favorable conditions of the atmosphere, i. e., by making the inspired air excessively warm and excessively moist, as is the case when the individual is subjected to the inhalation of steam, this physiological action is intensified. Such inhalations may therefore be used therapeutically, for under their use swollen mucous membrane shrinks, the engorged turbinals contract, the capillary spaces are restored to their normal size, and the openings of the accessory sinuses are made patent. Their therapeutic value may be enhanced by adding to the boiling water one of the volatile oils or balsams, such as menthol, eucalyptus, or the compound tincture of benzoin. The vapor of these drugs, probably by stimulating the activity of the ciliary movements, starts the flow of the nasal syphon, and aids materially in draining the sinuses.

Steam inhalations should not be administered from any of the face steaming apparatuses or croup-kettles which are sold for this purpose, as the steam emerges from such an apparatus in a forcible jet, which carries with it a fine spray of hot water, which may scorch the face. They are best administered from a broad open vessel, such as an ordinary basin, set up over an alcohol lamp. The head and entire apparatus are covered with a towel or blanket. After a few minutes the face begins to perspire and a discharge from the nose occurs. Within ten minutes thereafter the full benefit of the inhalation is obtained.

The value of steam inhalations in acute accessory sinus disease has been known for a long time; their persistent and repeated use is also distinctly beneficial in the palliative treatment of those chronic affections which are associated with thickened secretion and crust formation. The writer wishes, however, to call especial attention to the hitherto unknown fact that such inhalations may be used for diagnostic purposes in a certain class of cases.

One of the most common symptoms of sinus disease is headache, which, in the chronic cases takes the form of recurrent neuralgia.

Such headaches are caused by a temporary occlusion of the natural orifice of the affected sinus, and can generally be quickly relieved by the use of steam. *When, therefore, a patient with a recurrent headache of long standing, whether nasal symptoms, such as discharge, etc., be manifest or not, is subjected to the action of a steam inhalation as above described, if the headache be relieved, even though the relief be only partial or temporary, it can be definitely stated that the cause of the headache will be found in one of the accessory sinuses of the nose, or in the neighborhood of their natural orifices.*

The fact that this procedure, which may be called a test for the nasal origin of headache, gives reliable information only when the result is positive, and that failure of the inhalation to relieve the headache does not necessarily exclude accessory sinus disease, does not invalidate the test; nor does the fact that it gives us no information as to which sinus is affected. The fact that the specialist has more accurate and more definite means of diagnosis renders it less useful to him than to the general practitioner, who is unprepared for, or unskilled in the more exact diagnosis of intranasal conditions. For the general practitioner, this test constitutes a simple and harmless procedure, which will enable him to determine the cause of many a persistent headache, which has long resisted his efforts at internal medication. And the fact that a headache which is caused by accessory sinus disease, can be cured by appropriate surgical treatment, is one of the triumphs of which the modern rhinologist may justly be proud.

These observations upon the drainage of the sinuses, which are the result of a study of the course of the secretions in patients convalescing from acute sinus disease, in private practice, and in a large variety of clinical material in the service of Dr. Emil Mayer at the Mount Sinai Hospital Dispensary, with whom I am associated, may be summarized as follows:

The drainage of the accessory sinuses is influenced by gravitation to a slight degree in certain positions of the head. It is chiefly effected by ciliary activity, by the power of the secretion of creeping over the surface of the mucous membrane, i. e., adhesion, by capillary attraction at the natural orifices of the sinuses, and by the syphonage exerted by the nasal passages. The combined action of these forces is favored by the respiratory air currents, and by certain atmospheric conditions.

By exaggerating the favorable atmospheric conditions, as in the use of steam inhalations, a valuable therapeutic agent is obtained, by means of which the drainage of the sinuses can be improved in diseased conditions, and which action is so pronounced that its effects may be used for diagnostic purposes in a general way in a certain class of cases.

616 Madison avenue.

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**Treatment of Innocent Laryngeal Growths by the Galvano-Cautery.** A. WYLIE, *Lancet*, Nov. 23, 1907.

The advantages of the galvano-cautery are:

(1) That very minute growths can be obliterated and that, as far as experience shows, they do not return;

(2) That small vascular growths can be removed without the risk of haemorrhage.

(3) That it is far superior to chemical caustics; the dangers of local reaction arising from chromic and lactic acid are always considerable.

(4) That the technique is more reliable, more precise, and involves less risk of damage to adjacent structures.

(5) That the whole operation is in view of the surgeon, which is not the case with forceps.

(6) That by it small sessile growth on the mesial surface of the vocal cords are more thoroughly treated than by the forceps.

(7) That the stumps of growths already removed by other instruments can be obliterated by the cautery.

(8) The galvano-cautery cuts off the blood-supply and thus kills the growth, while the forceps often only removes the superficial parts; and

(9) That it diminishes the liability of local infectivity of papillomata. THOMSON.

## TOTAL DEAFNESS FOLLOWING INFECTIOUS DISEASES.

BY L. J. GOLDBACH, M. D., BALTIMORE, MD.

The disturbance of hearing or the absolute total deafness following as an after complication of the infectious diseases, occurs quite frequently. Meningitis, with its divisions of encephalitis and basilar-meningitis, seem to predominate; typhoid claims a goodly number, as well as diphtheria, parotiditis, hydrocephalus, syphilis, scarlet fever and measles.

It is true, in one sense of the word, the complications of labyrinthine deafness are not so numerous when comparison is made with other involvements following such maladies; nevertheless, when they do occur, the consequences are such that the sequela is usually total destruction to the organs of hearing. The cases occur usually in childhood, and the nerve deafness is bilateral. At times a case of unilateral nerve deafness may be seen; it is then commonly due to a parotiditis or scarlet fever, particularly parotiditis.

Infections of the organs of hearing may follow the train of a sporadic as well as an epidemic cerebro-spinal meningitis; or they may follow any meningeal complication affecting the middle or internal ear, bringing about total destruction to the organs of hearing, and consequently incurable deafness following. The pathological condition may go further and bring about deaf-mutism. Such occurs usually in childhood; yet there is no exemption for the adult. The sequelae of labyrinthine involvement leaves the diseased organs of hearing (the predilection seems to be for the auditory nerve), in an incurable state.

The pathological condition existing may be an exudate causing either a primary or secondary atrophy of the auditory nerve or its nucleus; or in the aqueductus cochlea or labyrinth; or a chemical change of the peri-lymph.

To bring forth this pathology, showing the destruction wrought and brought about by the diplococcus intra-cellularis meningitidis by the typhoid bacillus, by the Klebs-Loeffler bacillus and by the various forms of streptococci and the staphylococci, is a difficult proposition. Perhaps their attack is on the nerve fibers through the aqueductus cochleae or the labyrinth; or the weight of the infection may fall in particular on the endothelial covering of the

labyrintheal cavity. How shall we decide, when it shows itself by the different intensities, through the severity of its infection? Do we have, in the severest forms, the necrotic falling off of the soft parts of the labyrinth, or a labyrintheal deafness, due partly to the direct influence of the toxin, thereby leaving a cellular and fibrinous deposit on the endothelium of the bony frame work, or the purulent exudate dwindling to a small collection and covering the space cavity in the labyrinth to a more or less degree?

Here is a subject open for some interesting investigation, and especially when literature on this matter is so scarce. It presents innumerable difficulties; the post-mortems are few, and when made it is hard to draw any satisfactory conclusions regarding the pathological condition existing.

The middle ear shares in the inflammatory and purulent condition by the infection penetrating the fenestral openings, causing a rupturing of the tympanic membrane and bringing about inflammatory adhesions with a secondary necrosis of the ossicles. This latter condition is usually brought about by a direct infection through the Eustachian tube, caused by the toxin of scarlet fever or measles.

Those conditions causing marked contraction and thickening of the tympanic membrane with adherent immoble ossicles are usually due to some catarrhal condition, a peculiar diathesis, or a family tendency. Those conditions strangely noted of marked deafness, without any marked otoscopical changes are due, in the majority of cases, to the after complications of meningitis, typhoid fever and hydrocephalus.

What then, in summing the pathological condition, takes place? Are the results of such inflammatory reaction:

*First.* A degenerative or intercellular change of the auditory nerve or on its sheath?

*Second.* A perverted chemical change in the peri-lymphatic spaces of the labyrinth partly destroying its membranous structure?

*Third.* A secondary inflammatory exudate near or on the floor of the fourth ventricle, leading to secondary atrophy of the auditory nuclei?

*Fourth.* A pathological condition of the blood taking place—a toxaemia.

*Fifth.* An inflammatory exudation of the meninges extending to the acoustic nerve?

*Sixth.* Why is not the facial nerve involved in such violent inflammatory conditions; especially when it is in such close proximity to the eighth nerve?

In the clinical cases reported below, the otoscopical appearances did not show anything of a marked or suspected pathological change except one and that was due to measles. The tympanic membranes appeared normal; ossicles freely movable, and a patency of the Eustachian tube existing. On testing hearing by means of a continous toned series of the tuning forks and Galton's whistle, there showed absolutely no aerial or bone conduction; neither for the higher or lower tuned forks.

The treatment for such cases seems nil; local treatment, by the various methods that are known to the otologists, as well as trying to educate the nerve to various notes of the scale, proved to no avail. On one of the patients, an ossiculectomy was performed; I have not noticed any improvement in the patient's hearing. The constitutional treatment of pilocarpin, strychnia, increasing doses of potassium iodide, and the various other drugs supposed to have beneficial action, proved negative as regards any desired results. The patients were placed in as healthy general condition as possible. The results were far from being satisfactory.

May we, when such conditions occur in childhood, partly trust to the regenerative powers of the young in bringing back at least to some extent, the hearing, which, before the infection had taken place, was very good? Nevertheless, when a mental picture is drawn of the destruction and pathological changes that have taken place, especially within an area, that as yet has not been benefitted by the surgeon's knife, we must, for the present, be cautious as regards our prognosis. The patients, at the best, remain in their lamentable and pitiable condition.

MENINGITIS CASES.

*Case I.* L. S., male, eight years. Family history negative. Two brothers, both living and in good health. No sisters. No organic diseases in family. No venereal diseases. Child had the usual diseases of childhood, with the exception of diphtheria. No after complications.

General condition of patient, as regards organs of digestion, respiration, circulation and urinary apparatus, good.

He had the attack of basilar-meningitis when seven years old. The attack was a severe one. Three days after the beginning

there was an involvement of his speech. The attack lasted for four weeks; then patient gradually improved; the hearing and speech, however, did not. Now the child's general physical condition appears to be very good.

The child has absolutely no aerial or bone conduction. Otoscopical examination, negative.

*Case II.* M. S., girl, five years old. Family history, negative. One sister, healthy condition. Child had measles when one year old; no after complications. Pertussis when two years old.

March, 1907, had the attack of basilar meningitis. It was five weeks in duration. Second week of the disease, parent noticed the inability of child to hear. There is some involvement of her speech; the few words the child utters are very indistinct. At the present time I notice no improvement of the child. The general condition of patient appears to be very good. The otoscopical examination is negative.

TYPHOID FEVER.

*Case III.* C. B., aged twelve. Family history, negative. Five brothers and five sisters, all living and in good health. No organic diseases in family. No syphilis. During childhood had measles when eight years old. Pertussis, when nine years old. General condition of patient, as regards organs of digestion, respiration, circulation and kidneys, good.

His attack of typhoid began April 29, 1906; duration, five weeks. During the first week of his typhoid he was very delirious. Five days after his delirium, mother noticed child could not hear. The deafness came on at once; since then no improvement in the hearing has been noticed. Patient always suffered with headaches. The boy is the fifth child of eleven children. Otoscopical examination is negative.

*Case IV.* F. A., boy, fourteen years of age. Family history, negative. No diseases of childhood. His attack of typhoid lasted three weeks; during the second week his hearing became markedly involved. Now hearing is very poor; no aerial or bone conduction. Otoscopical examination, negative.

*Case VI.* Male, forty years of age. White, single. Family history, negative. Patient has Hutchinson's teeth. Had typhoid lasting five weeks; during the third week, he noticed his hearing becoming affected. The patient at present has a slight aerial conduction with the highest tuned forks. Otoscopical examination,

negative. Before the typhoid his hearing was good. General condition of patient at the present time is very good.

HYDROCEPHALUS.

*Case VII.* Boy, aged ten. Family history, negative. No diseases of childhood. The patient's mother, being an ignorant foreigner, made it impossible to get any history whatever. Mother said, "the boy seems well, though his hearing—no good." He hears the Galton whistle. Otoscopical examination showed nothing; the boy's vision is good; no defect in speech.

MEASLES.

*Case VIII.* H. B., male, eighteen years of age. Family history, negative. No diseases of childhood, with the exception of measles, which he had when five years of age. No venereal disease. The patient said that his hearing was very good before he had measles.

Otoscopical examination reveals a markedly thickened and retracted tympanic membrane. He hears the fork 2,048 double vibrations. No defect of vision or speech.

ADDENDUM.

Since writing the above I have succeeded by means of deep intratympanic massage (suction with release), in enabling case VI to to hear fork 512 $C^2$ by bone and aerial conduction. Formerly he could not hear any fork. His hearing has improved very much —more than I would have dared expect.

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**Bier's Hyperæmia. Special Application to Diseases of the Eye and Ear.** F. W. MILLER (Los Angeles) *South. Calif. Practitioner*, April, 1908.

Miller observes that the greatest number of opinions of the method are, so far, from foreign sources, and that there has not been sufficient work done in this country to justify an estimate of its value. Several cases of mastoid reported cured were palpably ordinary, acute, purulent, otitis, with evidence of mastoid tenderness; not uncommon in children. The treatment is effective only in acute or subacute cases, and requires skill, and properly selected cases. EATON.

# A CONSIDERATION OF THE INTRA-CRANIAL COMPLICATIONS OF SUPPURATIVE OTITIS MEDIA.*

BY J. J. THOMPSON, M. D., NEW YORK CITY.

Within the last few years a great deal has been written concerning the intracranial complications of middle ear suppurations, and our knowledge of these conditions has been greatly enriched, but at times they offer almost insurmountable difficulties, both as to diagnosis and treatment, and each case remains a law unto itself. There can be no doubt from the increased number of cases reported that cerebral infections are more frequently recognized, and more successfully dealt with than they were some ten years ago. Among the more common complications are meningitis, cerebral and cerebellar abscess, and jugular bulb and lateral sinus infections.

MENINGITIS may be divided into five general types, purulent lepto-meningitis, pachy-meningitis, serous, epidemic, and tubucular meningitis. The two latter do not usually follow in the wake of otitis media, or have it as a causal factor, although occasionally they may be associated with it, and offer difficulties in the way of diagnosis. Pachy-meningitis or inflammation of the dura, is not so serious in its consequences as the other forms, and as a separate condition must be rather rare, and after a short time, in the great majority of acute cases, merges into lepto-miningitis. This latter is the type with which otologists are principally concerned and, in fatal cases of ear disease, forms undoubtedly the most frequent cause of death. The cause is almost without exception an infection by some one of the pyogenic micro-organisms, by whatever route they gain entrance to the cranium. It follows chronic otitis much more frequently than the acute form of the disease, and is particularly liable to occur in an individual physically below par. A blow of sufficient severity is sometimes the exciting cause, either by opening a path of infection through a minute fracture of the tegmen tympani, or by rendering the meninges more susceptible on account of the accompanying congestion. More frequently the blood vessels or the lymphatics of the part are responsible for the transmission of the micro-organisms or they

*Candidates' thesis for admission to the American Laryngological, Rhinological and Otological Society, presented at the thirteenth annual meeting of the Society, New York City, May 30, 31, and June 1, 1907.

may find their way through dehiscences in the tympanic tegmen, or carious erosions of the bone in this location. I am inclined to think that when a meningitis develops during the course of a chronic suppuration, it is more frequently due to extension through the blood stream of lymph channels, than to direct contact of the membranes with infected material.

In cases of caries, where the tegmen of the middle ear or antrum is destroyed, brain abscess is liable to be a more frequent complication during the existence of which a meningitis may develop at any time from rupture, either on the surface or into a ventricle. This view is strengthened by the fact that at autopsy it has been in my experience rather rare to be able to trace direct continuity of the infection from the middle ear or exposed dura to the site of plastic exudate. This purulent or plastic material is very often found covering the entire base of the brain and extending even onto the other side along the Sylvian fissure, while the arachnoid at the site of exposure, if an operation has been performed, may be perfectly clear, or at the most slightly congested. In cases of this kind, it is not unlikely that the sheaths of the facial and auditory nerves, and the labyrinth itself offer a tract along which bacteria may travel.

Among the causes of meningitis must be mentioned the trauma occasioned by operations upon the mastoid. Possibly 20 per cent of all the fatal cases are the result, or at least follow these operations. The statistics upon this point brought out by Dr. Harris at the Boston meeting of the American Laryngological, Rhinological and Otological Society are rather startling. He stated that out of eighty-three radical operations performed at the Manhattan Eye and Ear Hospital, ten were followed by a fatal meningitis. This certainly is a subject that deserves serious consideration, and one is at a loss whether to construe it as an argument in favor of radical operation, only performed at an earlier date than we are accustomed to do it, or an indication of the great danger attending it. Out of a limited number of radical operations coming under my care during the past six months, two have been followed by meningitis, and one by cerebral abscess, all resulting fatally. In each case, the operation was undertaken solely for the cure of chronic suppuration in the tympanum, and in subjects that were apparently healthy, and had shown no indications of any intracranial lesions prior to their admittance to the hospital. It seems to make very little difference in the subsequent developments, whether the dura is ex-

posed at the time of operation or not. In fact, in each of the cases, mentioned above, the dura was not uncovered until after the alarming symptoms had manifested themselves. Whatever the explanation may be, it is certain that operative interference in a great many instances is the exciting cause of meningitis. It may be due to the open condition of the blood vessels in the region, or the accidental forcing of infection into the labyrinth during our manipulations within the middle ear, or to starting into activity a focus that has for some time been present but in a quiescent state.

The symptoms of meningitis are probably more pronounced than those of any of the other complications. Severe and persistent headache, associated at first with restlessness, and later with stupor, is always exceedingly suspicious, especially if accompanied by a sharp rise in the temperature. The headache may be localized in the frontal region at the beginning of the attack, but usually before long becomes more general, and is often most severe over the occiput. It is of greater severity than that found in abscess, and in children, or even in adults will cause them to call out continually. There is almost always a considerable increase in the rapidity of the pulse, and a moderate elevation of the temperature. This may reach as high as 105 degrees, and is not subject to any marked remissions. There may or may not be vomiting, more frequently it is absent. The eye symptoms do not usually develop until late in the disease, and are usually an indication that the base has become involved. There may then be a descending optic neuritis, and it is of a more inflammatory type than the choked disc that is seen as a result of increased intracranial pressure. Paralysis of the extra-ocular muscles is sometimes present from involvement of the nerves at the base of the brain. The pupils in the early stages are contracted, but with onset of coma they become widely dilated. One of the most valuable symptoms is a marked rigidity and contraction of the muscles of the neck, and except in the epidemic variety, it is a fair indication of a fatal termination. A similar contraction of the abdominal muscles is seen occasionally. The reflexes may be increased, and Kernig's sign may be elicited. Constipation is the rule at the beginning, but later the patient loses control of both bowels and bladder. Muscular twitching is often present, and may be confined to one limb or one group of muscles, or it may be general, involving all the limbs and the facial muscles as well. Nearing the end the pulse becomes very rapid and irregular, and the temperature may reach 106 degrees or higher.

These are some of the symptoms of the severe and typical cases, but we more frequently have only a few of them present, and it is then more difficult to make a correct diagnosis. There may be little more than severe pain, and elevation of pulse rate and temperature, a condition common to a great many general diseases.

I had a case recently, which two months after a mastoid operation suddenly developed a temperature of 104 degrees, and a corresponding increase in the pulse rate, accompanied by most intense pain in the head. No other symptoms were present except that there was occasional delirium. Taking into consideration the fact of a recent mastoid operation, the first diagnosis was meningitis, but within twenty-four hours, while the pain in the head markedly diminished, the mentality likewise improved. This had not been my previous experience in meningitis cases, the pain usually subsiding with the onset of stupor. On this account I was suspicious of some general disease, and had a blood count and Widal test made. The leucocytes only numbered a little over 4,000 per cubic millimeter, but the first Widal test was negative. A second one showed clumping beautifully, and the case ran the usual course of typhoid fever. Shortly afterward a case showing almost identical symptoms, except that the severity of the head pain did not lessen until the onset of stupor, died of meningitis which involved the entire base of the brain. Types of this kind are sometimes most difficult to diagnose in the early stages. Since the employment of lumbar puncture has become more general, and the interpretation of its findings has become better understood, it offers valuable aid. If definite abnormalities are found, they are almost positive evidence of changes in the meninges; but, on the other hand, their absence does not necessarily mean that there is no lesion of the meningeal coverings; in other words, positive findings are of the greatest value, but we must not be led into the error of considering that because the fluid is apparently normal in every respect, we are dealing with a condition other than meningitis. Some claim to be able to differentiate the various forms of meningitis by the microscopical examination of the fluid. Basing their opinions on the specific gravity, and the number of leucocytes and other fixed elements found, together with the bacteriological findings. Tubercular bacilli, streptococci, staphylococci, and pneumococci are the micro-organisms generally found.

From a practical standpoint, however, the greatest value is generally placed on the force with which the fluid flows when the

puncture is made, and the microscopical appearance which it presents, relying on the general history and other clinical records to determine the particular form of meningitis with which we are dealing. In the majority of cases the fluid will issue with sufficient force to demonstrate that it is retained under pressure, and in meningitis of more than a few hours duration it should be cloudy in appearance, instead of clear as it normally is. The presence of any of the above enumerated micro-organisms of course is additional proof that the meninges are affected, but it is always possible that this invasion is not primary, but due to the rupture of an old abscess, that has failed to show itself by symptoms. The blood count is not so characteristic, as in sinus thrombosis, or abscess, and depends somewhat on the severity of the infection, and the degree of absorption.

An opalescent turbidity of the withdrawn fluid is regarded by Schwartze as positive diagnostic evidence of tubercular-meningitis, but without the presence of tubercular bacilli, too much dependence cannot be placed upon it.

The meningitis of children offers the greatest difficulty in differentiation. It is in childhood that tubercular-meningitis is most frequent, and is found in its most characteristic form, whether complicating a chronic otorrhea or existing independently of it, but it does occur rarely in adults. A case of unusual interest came under my care during the past summer. The patient was a young man, twenty-two years of age, who came from the country for the purpose of having a radical operation for the cure of an otorrhea that had persisted in spite of treatment for several years. During that time he had not shown any indications of intra-cranial trouble, and none was suspected when the operation was undertaken. On uncovering the dura over the tegmen antri, it presented an unusual appearance. It did not show the usual tenseness and elasticity, and was covered with the most minute white spots, each one being smaller than the head of a pin. Without knowing anything about the history of the young man, I remarked at the time, that although I had never seen a case like it, the spots resembled very closely military tubercles. I made a small opening in the dura, and on inserting a probe, it seemed to drop into a cavity about the size of a cherry, but nothing was evacuated from it. I enlarged the opening and packed the cavity with gauze. At the first dressing, the opening in the dura, which three days previously had been only a slit, was now the size of a silver quarter, the mem-

brane having undergone complete destruction to that extent, and considerable necrotic cerebral tissue could be wiped from the walls of the cavity. There was only a slight elevation of temperature for a few days, and the patient progressed so favorably that he was discharged from the hospital. At the end of about four weeks he presented himself suffering from intense headache, his temperature was 103 degrees, and he showed all the symptoms of a beginning meningitis, or an extension of pus formations in the cranium. Owing to the tendency of brain abscesses to form new pockets, the latter was suspected, and the surrounding brain tissue was thoroughly explored without finding anything of that nature. The patient died three days later, and autopsy showed a large plastic exudate at the cerebral base. I learned afterward from the family physician, that a brother of the young man had died a year or two previously of tuberculosis, and I have always thought that the peculiar appearance of the dura observed at the time of the operation was due to tuberculosis, and that the lepto-meningitis from which he died was similar in nature.

After mastoid operations we occasionally have a few days in which the temperature is elevated, the patient is extremely restless, the pulse is rapid, and a general condition of irritability exists, that I think can in many cases be accounted for by a condition of meningeal irritation not reaching to the extent of actual inflammation on account of the absence of infection. This does not seem at all improbable when we consider the indirect traumatism that the meninges are subject to from the use of the mallet, and often from exposure during the course of the operation. This, of course, is not serious, and entirely disappears in a few days. On the other hand, the prognosis in the ordinary form of lepto-meningitis is extremely grave, in fact, a good many observers go as far as to say that recovery is impossible, and that where death is not the result, there has been an error in diagnosis. While I am not convinced that this is true, no doubt the percentage of recoveries is very small indeed, and in successful cases it seems that there must be some other cause for the recovery than the beneficial effects of any particular form of treatment employed.

In regard to the treatment, very little can be done beyond keeping the patient as quiet as possible, and applying an ice coil to the head, together with free catharsis. There are no drugs that have any appreciable effect. Recently some good results have been reported from the use of lumbar puncture, but beyond relieving the

pressure, and in this way ameliorating the symptoms, it is hard to see how it can have very much beneficial influence. It is claimed that by removing a certain amount of the fluid, its place is rapidly taken by a new supply that has some bactericidal action, and in this way the infection is overcome, but it has not been satisfactorily proven that this does actually occur. The introduction of remedial agents at the site of puncture is of no value in the type of meningitis met with as the result of middle ear suppuration, though it may be valuable in cerebro-spinal meningitis. Another measure that has been advocated is ventricular puncture, and the withdrawal of the spinal fluid in this way. I saw one case in which this was tried and the child recovered. Shortly afterward I saw it tried in another case and the patient died in three hours. I am sure that the effort to introduce a needle into the ventricle hastened the end, although a fatal termination seemed inevitable anyway. At the autopsy on the last case mentioned the ventricle was found entirely filled with clot, and the needle punctures were each surrounded by extravasated blood.

The most rational procedure where a diagnosis of meningitis has been made is to afford the best possible drainage at the site of infection if possible. If no operation has been done, the dura over the tegmen of the antrum and tympanum should be exposed, and sufficient of its bony covering removed to allow of the best possible drainage. If the meningitis follows an operation on the mastoid, the same holds good and sufficient bone should be removed to expose a large surrounding area of macroscopically healthy dura. Even with the greatest care this rarely has any effect upon the ultimate outcome of the case, for as previously stated, the extension to the base of the brain does not usually occur by direct continuity along the arachnoid, but through the lymphatics or blood stream.

Abscess.—In speaking of intra-cranial abscess of otitic origin, we can practically eliminate all abscesses except those occurring in the tempero-sphenoidal lobe, and in the cerebellum, on account of the proximity of these parts to the ear. While it is perfectly possible for an abscess to develop in a remote part of the brain as a result of suppuration in the middle ear it is comparatively rare, and the infection is much more likely to occur from the local destruction of bone, and the contact of the brain tissues with infected material, than from the transmission of micro-organisms through the blood stream, as I have stated frequently occurs in

meningitis. For this same reason lesions in the tympanum and in the antrum are likely to produce abscess formation in the temporo-sphenoidal lobe, while those in the lateral sinus and in the labyrinth give pus pockets in the cerebellum. They occur most frequently between the ages of ten and thirty and next between thirty-five and fifty. They are rare before the age of ten, and are not often found in very old subjects. The detection of intra-cranial abscess is a matter of great difficulty and importance, from the fact that about forty per cent of cases diagnosed early make a good recovery, and it has been estimated that in Germany about 12,000 cases occur annually.

They are difficult to diagnose because they show fewer typical symptoms than any of the other intra-cranial complications of otitic origin, and they may remain in a quiescent state as far as symptoms are concerned for a long time. When manifestations are present, they are often so vague, and variable as not to draw attention to the true condition, until a great deal of destruction has been produced. Post mortems occasionally show large accumulations that have given rise to absolutely no symptoms and have been overlooked. This is particularly true of collections in the temporo-sphenoidal lobe on the right side. In the early diagnosis most careful attention must be paid to the general aspect of the case, and the manner and temperament of the patient. Friends should be carefully questioned regarding recent changes in the disposition, and personal habits, etc. A person possessed of an amiable disposition will occasionally become surly, and forgetful of personal cleanliness, and changed in his entire bearing toward his friends and relatives, without having actual hallucinations or delusions. The memory may become deficient, and dull headache, especially on exhaustion, is among one of the earliest symptoms, in fact, in the presence of a chronic aural discharge, one should always be suspicious of a headache that does not yield to ordinary measures. The headache may be localized to the side of the lesion, but this is by no means always the case, as an abscess in the temporal region is quite as likely to produce a frontal headache as one confined to the side of the head. Variation in the amount of discharge is sometimes noticed. There may be periods of marked exacerbation followed by complete cessation, indicating that a cavity larger than the mastoid antrum allows of its accumulation. Little is to be learned from the temperature. It is not usually elevated to any extent, in fact, a low temperature with other signs of absorp-

tion is considered one of the best symptoms of abscess formation, in contradistinction to sinus involvement and meningitis. On the other hand the temperature may be elevated, so that it is of very slight value in making a diagnosis. A slow pulse is of greater significance, and is much more likely to be present in abscess than in any other condition occurring as a result of middle ear suppuration. It may fall to 60 or lower, and if accompanied by a rise of temperature is very significant, although many adults have a pulse of 60 in perfect health. Percussion over the site of the abscess is all times accompanied by pain and a sensation different from that in other parts of the cranium is experienced by the patient. Among the symptoms found in a later stage may be mentioned mental inefficiency and inability to concentrate. In abscess occurring on the left side aphasia is one of the most valuable symptoms. The patient while perfectly aware of the name of any article and familiar with its uses is unable by any effort to pronounce its name. This is almost a typical symptom, and I have seen it present in several cases, and have noted it reported in many others. I have seen it also in one case of right sided abscess but am unable to recall whether or not the patient was left-handed.

During the past summer I had the opportunity of seeing a young man suffering from an abscess of traumatic origin in the lower portion of the ascending parietal and ascending frontal convolutions, in which the destruction of the brain was very extensive. Some time previously a piece of coal had been driven into the cranial cavity, and the abscess developed as a result. He showed a rather peculiar symptom during the time that the pus collection was under pressure. In conversation he always used the third person instead of the first in referring to himself. His name was Edward, and instead of saying, "I want a drink of water," he would say, "Edward wants a drink of water." If asked how he felt, he would say, "Edward feels better to-day," and so on through his entire conversation. One peculiar sentence that I remember him saying was, "Edward's nurse is good to Edward." After the abscess cavity had been opened, and the necrotic tissue, as well as the collected pus had been removed, he reverted to the ordinary type of conversation, and always used the first person where it was properly required. After making a favorable advance for several weeks he finally died from basilar meningitis, but at no time returned to the use of the third person in place of the first, in the course of his conversation. During the treatment of this case I

happened upon a procedure that I have not been able to find mentioned in the literature, and in this particular instance was of the greatest value, namely—compression of the jugular veins for the purpose of extruding the necrotic brain tissue. After incising the abscess and obtaining a small flow of pus, the dura and surrounding brain seemed to be in a collapsed condition, and even the introduction of a large curette failed to bring out any more pus. I did not have an encephaloscope with me, so after waiting for a few moments for the voluntary flow of any more necrotic tissue, I forcibly compressed both jugular veins in the neck, and after the lapse of a few seconds, representing the time requireed for sufficient increase in the intra-cranial pressure, I was amazed to see at least two ounces of pus and necrotic debris flow from the wound. For the sake of noticing the effect, several times I released my hold on the neck, when the flow would immediately cease, the brain tissue collapse, and any pus visible in the wound would be drawn back into the cavity within the brain. With the resumption of the pressure the flow of pus again commenced, each successive time requiring a longer period of pressure than the previous one, until finally nothing but what appeared to be blood came from the wound. It struck me at the time, and I have had reason to think so since, that this would be a useful procedure in all cases of abscess formation, for we are all familiar with the tendence of these pus accumulations in the cerebrum to burrow and form subsidary pockets, which it is at times impossible to detect until they are of sufficient size to erode their way into the parent cavity, or to produce symptoms from their pressure. Not only that, but I have often seen during autopsy, an abscess that in spite of repeated exploratory punctures into the temporo-sphenoidal lobe had not been struck, and which in some instances had only been missed by a few lines. It seems to me that in some of these cases, if the intra-cranial pressure were sufficiently increased, the pus might find its way to the nearest incision. With the exception of cases suffering from degenerative changes in the arterial system, I do not see how any damage could be done by this increase of pressure. Where it is of greatest value is in the treatment of cases in which an abscess has already been evacuated. At each dressing, the cavity can in this way be cleansed with less injury to normal brain tissue than by mopping the cavity with gauze, and with no more injury than where irrigation is used, with the additional advantage as before stated of evacuating connecting pockets.

To return to the symptomatology of cerebral abscess, vomiting is a valuable and frequent, though not constant symptom. The vomiting is usually of the projectile type, and occurs independently of the injection of food. The eyes sometimes offer vaulable evidence of this condition, the pupils may be unequal, most frequently showing dilation on the side of the lesion, and they may be inactive to light and accommodation. An optic neuritis occurs in about fifty per cent of cerebral abscesses according to some authorities, but in the cases I have seen, it has not been present as frequently as that, and must be classed among the later symptoms. It occurs with much greater frequency in cerebellar lesions, and in tumors than in abscess of the cerebrum. This may be accounted for by the fact that in a good many instances the optic neuritis is an indication of pressure, and abscess formation being a destructive lesion has not the same tendency to increase the pressure as a tumor, which consists essentially in the formation of new elements. Extraocular palsies are not often found owing to the location of the lesion, and when they do occur they are the result of pressure exerted on the nerves emerging at the base of the brain, rather from direct involvement of the nuclei themselves. If rupture of the abscess should occur, either on the surface or into a ventricle, the symptoms assume a sudden and grave character, muscular twitching, wide dilation of the pupils, involuntary passage of urine and feces, being among those most commonly found. The blood count is of considerable value in determining whether or not pus is accumulating within the cranium. The total number of leucocytes will almost invariably be increased, possibly to 16,000 or 18,000, with a relative increase in the number of polymorphonuclear neutrophiles. I am of the opinion however, that it is a mistake to place too much dependence on the blood count in making a diagnosis, and while it may be a valuable aid, and undoubtedly is, in a great many instances it is liable to be misleading. To satisfy myself of this fact, I had a blood count made in a series of cases of simple mastoiditis, showing no signs of intra-cranial complication, and in a considerable number found that with a total increase of the leucocytes as high as 22,000, and in one instance a polymorphonuclear percentage of 85, nothing developed after the ordinary mastoid operation had been performed. Therefore, while the blood count is a valuable adjunct to the clinical symptoms, we should not consider that every individual showing a pro-

nounced deviation from the normal is necessarily the subject of an intra-cranial lesion.

The examination of the cerebro-spinal fluid has not the same significance in cerebral abscess as it has in meningitis. Dr. F. L. Jack, of Boston, states that in cases of his he has found the fluid cloudy in abscess formation as well as in meningitis, and I have often wondered what is the condition of the fluid in all febrile conditions. I have not seen the report of any work done along this line, and it has frequently occurred to me that the spinal fluid may show an increase in its albuminous constituents during the course of a high fever, whatever may be its origin, just as the urine does. A clear fluid expelled under excessive pressure argues to a certain extent the presence of an abscess or tumor, as this will more readily account for an increased pressure without change in the constitution of the fluid, than any other intra-cranial condition. No satisfactory results have ever been obtained from the use of X-Rays in localizing cerebral or cerebellum abscesses.

Localizing symptoms of cerebral abscess, that is the various muscular paralyses, are not often encountered, and when they are present, are invariably a late manifestation. They are always hemiplegic in type, and may be slight or extensive, and when present offer the best means of estimating the exact location of the lesion. An abscess invading the motor area, or making pressure upon it, will give a paralysis of the opposite side, involving the arm more frequently than the leg, and when the lesion exists on the left side aphasia is generally an associated condition.

These may be considered the more important of the objective and subjective symptoms of cerebral abscess, that are apparent before the exposure of the brain coverings, but there remain to be discussed the various signs that are present when the bony covering having been removed, a portion of the intra-cranial contents is exposed to view. In some instances the appearance of the dura cannot be mistaken. It may show a discolored and bulging surface, or even a fistulous tract through which pus or purulent fluid is escaping; but, on the other hand, in deep-seated accumulations it may not differ in the least from the normal. The presence or absence of pulsation is not of any particular significance, being absent it seems to me, in the great majority of cases where the intra-cranial contents are healthy. The presence of granulations on the dura does not point to any lesion beneath it, and is nature's most

effective barrier against contamination of its contents. A healthy appearance of the dura, in the presence of clinical symptoms pointing to brain abscess, should not deter us from a thorough exploration of the brain, for it is a fact well known that it is not common to find accumulations of pus immediately beneath this membrane, and that in the great majority of cases they are situated at some distance from the surface.

An abscess of any considerable size situated within the cerebellum is more likely to manifest itself by definite symptoms than is one in the cerebrum. The headache is generally most severe at the occiput, and rigidity of the neck muscles is often present. Optic neuritis is an early symptom, the characteristic cerebellar gait or titubation is rarely lacking, and other symptoms of muscular incoordination will usually be found if carefully sought. Paralysis of the cranial nerves due to pressure on the motor tracts in the cerebral crura are among the best diagnostic signs of cerebellar abscess. These show themselves with greatest regularity in the external recti muscles of the eyes supplied by the sixth nerve, and in the muscles of the tongue supplied by the hypoglossal. A weakness of one or both external recti muscles not amounting to paralysis, and not of sufficient severity to produce internal strabismus, is seen early in cerebellar abscess. Nystagmus, elicited on extreme lateral rotation of the eyes, is also to be looked for, as well as an area of sensory anaesthesia. The gait in cerebellar disease is staggering, closely resembling the movements of one who is intoxicated, motion usually tending to the side of the lesion, although this is not constant. It does not in any way resemble that of locomotor ataxia, and cannot well be mistaken for it. In one case that I saw recently after the patient was unable to move forward, he could make considerable progress backward, and in a direction opposite to the side on which the lesion was situated. Motor paralysis on the side opposite to the lesion is not uncommon from pressure on the crura cerebri of the same side, and various phenomena resulting from damning back of the cerebrospinal fluid, and interference with the circulation in the veins of Galen may manifest themselves.

The prognosis in cases of cerebellar abscess is not so good as in those occurring in the cerebrum. Notwithstanding the results reported by Horsley, the surgical efforts exerted in this country have not been crowned with the same success, and a large majority of the cases of this class end fatally.

The treatment of both cerebral and cerebellar abscess is entirely surgical, and any discussion of this phase of my topic must concern merely the best means of attacking these conditions, and their subsequent treatment after evacuation. In regard to the surgical procedure in cases of pus collections in the tempero-sphenoidal lobe, I think they should be divided into two classes, the first class consisting of those cases in which we are certain of the presence of such a condition, and also have definite ideas regarding its location; and the second class including those in which the presence of an abscess is only conjectured, or in which one is discovered at the time of a mastoid operation, and also those where from any cause one is believed to be present subsequent to the evisceration of the mastoid and middle ear. The latter class is by far the larger.

Where an abscess has been definitely located, it is the best surgery to attack it through an opening in the skull over the site, as this will allow of better inspection and more thorough evacuation than where a mastoid operation is first performed and the abscess opened through the dura above the roof of the antrum. On the other hand, where we already have the mastoid opened and are not sure, even of the presence of an abscess, and much less so of its location, on account of the absence of localizing symptoms, I am not sure that it is the wisest course. I know that it is generally advocated, the claim being made that a more sterile field is thus obtained; but in view of the large number of successful cases that are reported by a great many different operators, in which drainage has been maintained only through an opening into the mastoid wound, I am not convinced that this is not almost as good a procedure as to open the skull above the temporal ridge. It seems to me that for instance, where a radical operation has been performed, and all evidence of necrosis removed, and where the cavity is thoroughly flushed with antiseptic solutions, the wound is almost if not entirely as aseptic as one made through the hairy scalp, no matter how thoroughly it may be prepared. In addition, it seems to me that better drainage is obtained through an opening in this position than through one in any other region. It is the most dependent part, and in the majority of cases the abscess is liable to be situated nearer the surface here than any place else, and the mastoid wound may be kept open a long time with greater ease than one that has been made through the scalp. If, after exploring the brain, we find we have been mistaken in our diag-

nosis, as occurred to me recently, we have not subjected the patient to an additional loss of the bony covering of the cranial contents, and taking all things into consideration, if we are not sure of the location of the abscess we seek, I think the exploration may be undertaken with propriety through the dura above the roof of the antrum. An exploring needle, unless of large size, is not much use for this purpose because, unless provided with an obsturator, the soft brain tissues will fill its lumen before the cavity is entered, if one exists. A long-bladed scapel is better adapted to this purpose and the temporo-sphenoidal lobe should be punctured in all directions. It is preferable to make a number of small punctures in the dura rather than one long slit, prior to the discovery of pus, as cerebral hernia is not so liable to follow. If an abscess is disclosed, the dura should then be thoroughly opened and all necrotic contents removed, and its walls inspected with an encephaloscope, with a view of finding any communicating pockets that may exist. A large sized rubber drainage tube should be inserted, and the ordinary dressings applied. In most cases a rubber tube offers better drainage than gauze, allowing the intra-cranial pressure to force the newly formed contents of the cavity through its lumen, where gauze, in many instances, would act as a plug, and prevent their escape. At the subsequent dressings the cavity may be flushed with saline solution, and as I have stated before, I think it is a valuable procedure to moderately increase the intra-cranial pressure by compressing the jugular veins, in that way forcing out any broken down brain tissue that may have a tendency to remain behind. We should always be on the lookout for the formation of new collections, and open them as soon as they are found. Sufficient pressure of an even character must be maintained to prevent the formation of hernia.

Lateral Sinus Infections: Of all the sequelae of otitis media, lateral sinus thrombosis presents the most characteristic symptomatology, and offers by far the most favorable prognosis. If diagnosed early, and in the majority of cases this is not difficult, it may be attacked with reasonable assurance of success, unless complicated with abscess extension or meningitis. There are many ways in which infection of the sinus may occur. It may be due to the direct contact of the sinus with infective material in the mastoid cells, or even in the mastoid antrum when the sinus is situated abnormally far forward, or infection may be carried by its minute tributaries that drain the middle ear and mastoid process.

It is with rare exceptions secondary to mastoiditis and is always attacked through the mastoid process. No particular organism is especially prone to produce this condition, except as it may influence the extent and virulency of the mastoid involvement. When it occurs independent of mastoiditis, the lesion is usually located in the jugular bulb, thrombosis being produced by infection through the floor of the middle ear. This is more frequent in children, and this fact is accounted for by the occasional presence of bony dehiscences, or an unusually high dome for the reception of the sinus bulb.

Although it usually shows a group of unmistakable symptoms, at times these are not present, and it is not until upon uncovering the sinus that we are led to open it by the appearance of the vein itself. In a measure its symptoms are passive as compared with those of meningitis and brain abscess, if such a term may be used. There is rarely any great amount of pain or headache, the patient does not complain much, but is drowsy and may have a tendency to sleep the greater part of the time. Upon arousing him he will generally answer questions in an intelligent manner, but will lapse again as soon as conversation is discontinued. Often there is an initial chill followed by others. The temperature is the most characteristic symptom, showing an evening rise of as high as 106 degrees, in many cases only to drop to normal in the morning. This is not an invariable fact, however, for I had a case during the past summer in which the temperature did not fall below 105 degrees at any time from the first chill until its fatal termination.

The temperature may not be so high as in that case, but range between 102 degrees and 104 degrees, with slight diurnal remissions; likewise instead of one distinct chill there may be several periods during which chilly sensations are felt. The sharpness with which these two symptoms are marked depends upon the amount of septic material entering the system. If large quantities are being rapidly absorbed, the temperature during the rise will be very high, and the remissions pronounced, while if absorption is moderate in amount and slow, the variations will be slight, and the highest temperature record may not be above 103 degrees. The pulse rate is increased in proportion to the height of the temperature, and in severe cases will often reach 170 and higher. Oedema over the mastoid, and particularly over the region of exit of the mastoid vein is a valuable sign and should invariably be sought

when sinus thrombosis is suspected, being due to blocking of the circulation in the neighborhood. Likewise if the clot extends to the cavernous sinus, oedema may be present in the eyelid of the same side and congestion of the ocular conjunctiva may accompany it. Choked disc is sometimes produced by the damming back of the return circulation through the ophthalmic vein. One of my successful cases showed this condition together with retinal hemorrhages for some time after the operation, but it eventually cleared up without leaving any impairment of the vision. Vertigo and vomiting are variable symptoms, and in the cases that I have seen have not been present to any extent. If the condition has existed for any time the patient shows all the symptoms of profound septic intoxication. The complexion is livid, the expression is anxious, and the tongue coated, etc. This evidence of absorption is about one of the most valuable aids in making a diagnosis. If other sources can be eliminated in the presence of an otorrhea, the sinus is the most likely source from which the supply of septic material is derived. The blood count is of greater value in this than in any of the other intra-cranial complications, merely inasmuch as it is an index of the degree to which the system is influenced by the toxaemia. The percentage of polymorphonuclear neutrophiles is of much greater importance in determining the prognosis, than the total number of leucocytes. In a case of any severity they will usually reach 18,000, and the percentage of polymorphonuclear cells will be over 80, and occasionally as high as 90.

A valuable sign, but one requiring a delicate technic, is the finding of bacteria in the blood stream. If this can be accomplished it offers almost positive evidence of thrombosis in the sinus, or jugular bulb, provided other sources of entrance can be eliminated beyond a reasonable doubt. However, the greatest care to prevent outside contamination is required, and the technic is so difficult and troublesome, and calls for such elaborate paraphernalia, that for ordinary clinical use it is not much used. Occasionally rigidity of the neck is noted, but the cordlike feel that is described as following the course of the vein, I have never been able to positively make out. In children, if the diagnosis has been delayed, the cervicle glands may enlarge rapidly, and even suppurate. I had a case this summer in which the cervicle glands formed a bunch as large as a hen's egg, and in which they were completely broken down.

The treatment of this condition has been the subject of extensive discussion during the past few years, and still there is no unanimity of opinion as to just what is the best course to pursue. One must be guided by the circumstances, and the conditions encountered in each particular case, and there is probably no other condition in otological surgery that requires such fine judgment in deciding the best course to follow. No set rule can be formulated to fit every case, and what will prove successful in one instance will be fatal in another, but one thing that applies to all cases, at all times, is the greatest conservatism with regard to the time spent in operating. With the possible exception of diabetics, speed seems to be of more importance in cases of sinus thrombosis, than in any others on which we are called to operate. Some operators claim that it is best to ligate the jugular vein before attempting to curette the jugular bulb, in all instances in which the clot extends that far, while others of equal skill maintain that this is not necessary except in the most extensive cases. From an experience as limited as mine has been, it is not possible to form any conclusions of value, except to the extent that they draw attention to the points made by other operators. In a fair proportion of cases we may not suspect sinus involvement until after the vessel has been uncovered, either accidentally or intentionally, and we are sometimes very much in doubt as to the necessity of opening it for investigation. I am firmly of the opinion that no one can be positive of the condition existing in the interior of a sinus until after it has been opened and inspected, and if carefully done this will not add any to the gravity of the operation, but many times will reveal conditions of the greatest importance. Whenever there is the slightest doubt the safest course is to open the sinus wall. Puncture with a needle is not of the least value, but on the contrary is very misleading, for with a peripheral clot, or one existing below or above the site of puncture, fluid blood may flow into the needle. The normal sinus has a somewhat characteristic blue appearance, while one containing a thrombus will often present a paler color. Pulsation is not a guide, nor can much be learned from palpation, because a mural clot can not be detected by the finger, nor will it interfere with the pulsation in the sinus. Dimpling is a more valuable sign, as it usually occurs in sinuses that are almost completely obstructed. All cases are not difficult to diagnose, a great many showing signs that cannot be mistaken, such as solidity of the vessel and marked dis-

coloration, but in a large proportion of cases that have shown undoubted symptoms of thrombosis, the sinus on exposure will show no indications of involvement. In such cases it is advisable to open the sinus before proceeding to a jugular resection. Just in what cases it is advisable to do a jugular resection before opening the sinus, is not easy to determine, and is the source of some differences of opinion.

The scope of this paper will not permit of a full résumé of this phase of sinus thrombosis, but I will endeavor in a few words to state what to me seems a rational procedure. In studying the statistics of the subject, we must consider that they are liable to be very much in favor of primary resection, because in a great many cases where this is done and the outcome is favorable, it is possible that the same result might have been obtained with more simple methods, while in the fatal cases in which the resection has not been done, the outcome might not have been altered by that operation.

If we are sure that a clot extends into the bulb or beyond it, it is better to resect the vein before dealing with the sinus, but these cases form the minority of those coming under observation. Where we are not sure of this, it is better to deal with the sinus first in the hope that the neck operation may be avoided. If the clot can be definitely located in the upper portion of the verticle limb of the sinus, a gauze plug should be placed across the sinus as low as possible and well below the cardiac end of the thrombus, and the vessel wall slit up with a pair of scissors, until the upper end of the clot is passed and free bleeding occurs from the torcular end. The ontents should then be removed as well as the entire outer wall of the sinus. Care must be taken in doing this not to puncture the inner wall, and in this way infect the endocranial lymph space. If necessary, more bone must be removed and the sinus followed toward the torcula, until such free bleeding is obtained as to render us reasonably sure that the torcular limit of the thrombus has been passed, and inspection of the lumen of the vessel has verified it. We cannot often demarcate a clot so accurately as to be sure that its lower portion does not extend so low that we are unable to insert a plug below its bulbar end, and in such cases it is better to open the sinus before making any pressure in this region, for fear particles may be dislodged and forced into the jugular vein. In order to do this, we should have two plugs in readiness, and then

make a free slit in the sinus. If bleeding occurs freely, a compression plug should be placed on the torcular side of our incision, and if hemorrhage now ceases, we know the clot exists toward the bulb. If we believe it does not extend to the bulb, while the assistant makes pressure over the jugular, the thrombus may be curetted from the sinus and the wall slit further in this direction, after which pressure is made to control the bleeding when free return flow is obtained. If on compressing the torcular end we still have a rapid flow of blood from the sinus, we conclude that the thrombus is situated on the torcular side of the plug, and the plug at the lower end of the verticle limb is placed in position without so much fear of jamming any particles into the general circulation. The vessel wall is then opened toward the torcular until the upper limit of the clot has surely been removed, removing as much bone as is necessary for freedom of manipulation, and to get well into the healthy sinus. The entire outer wall of the sinus should be clipped away with scissors in order to allow the abscess cavity to be drained in a perfect manner.

The most difficult cases in which to know just how to proceed are those in which we cannot determine the exact conditions within the bulb, and below it. The fact that we obtain profuse bleeding from the cardiac end of our incision in the sinus is not sufficient evidence that we have reached the end of the thrombus in that direction, because with a clot situated below the jugular bulb I believe we get as free hemorrhage as where the vein is free. This is due to the fact that very little of the blood flowing from the bulbar end of the verticle sinus passs through the jugular vein. The greater part is supplied by the inferior petrosal sinus entering into the bulb. This is shown by the fact that little influence is produced on this flow by compressing the jugular vein in the neck, and by the flaccid condition of this vein when exposed, also by the rapidity with which it fills from above, compared to that with which it fills from below. Therefore, profuse hemorrhage only indicates that the bulb itself is comparatively free from the clot, for it may be obtained with a complete thrombus situated in the jugular vein, or with a partial one in the bulb.

It is claimed by some writers that it is a serious error to curet the lower portion of the verticle sinus and that portion leading to the bulb before first resecting the jugular vein, but I am inclined to think this is a little radical in view of the excellent results that

are often obtained by this method. It is obviously impossible to curet the bulb itself, on account of its anatomical position and the double curve that would have to be overcome, so that it seems to me if we can dislodge the clot, that in all probability exists above the bulb, and in this way obtain free bleeding, the rush of blood through the inferior petrosal sinus would have a tendency to force any portions of thrombus that may remain into the open wound. In order to direct the stream from the inferior petrosal in that direction, and in fact, during all manipulations of the lateral sinus, the jugular on the same side should be compressed by an assistant. If small particles do remain, in a good many instances they can be taken care of by the economy under its improved conditions, and although there is no way of telling, in some instances we may presume that the lower portion has not become infected. I feel sure that in this particular class of cases this is a safe and conservative procedure, especially in view of the added risk involved in the prolonged operation of jugular resection. I say prolonged, because, while the operation itself in skilled hands does not take long, considerable time is consumed in preparing the patient, and making ready for operation in a new field. If our conservatism and hopeful surmises prove incorrect, and we have not sufficiently eradicated the focus of infection, so that the economy can care for the balance, indicative symptoms will appear in a few days, and we can then under improved conditions, rapidly remove the vein. I know that this admission of occasional failure is open to the criticism, that in the meantime thrombosis may have extended into the inferior petrosal sinus, and be practically beyond our reach, but even the performance of a jugular resection at an early date does not preclude the occurrence of this event, and in view of the many successful cases treated in this manner, unless we are sure of somewhat extensive thrombosis in the bulb, I think it is the course that gives in most instances the best chance to the patient. I do not fully agree with those who think a second operation is more liable to be fatal than a single prolonged one. One of the worst cases I have seen was the one mentioned earlier in this paper in which there was extreme toxaemia, pus in the jugular vein, and infected glands in the neck, yet it seemed certain that death on the table would be the result if we persisted in finishing the operation on the first attempt, so the patient was put to bed before the jugular or glands had been touched. Within the next three days, owing to the removal of part of the infecting focus, the patient showed con-

siderable improvement, and the jugular vein and glands were removed, the child making a perfect recovery in a short time. If I am not mistaken, it is the opinion of many general surgeons, and the opinion is becoming more widespread, that it is better to do prolonged operations in two stages, than to maintain anaesthesia too long at one time, and I think this applies to cases of jugular thrombosis where the resisting power is generally low.

Of course, if on curetting the lower portion of the lateral sinus, and as near to the bulb as possible, wo do not obtain free bleeding, it is an indication that the return flow from the inferior petrosal sinus is retarded either by thrombosis of this vessel itself or by a clot in the bulb, and in these cases I think resection of the jugular is advisable.

In addition to the actual operative treatment of thrombosis, the after care of the patient is of great importance. Saline enemata to compensate for the blood that is, of necessity, lost are of great value, and persistent stimulation should be maintained.

40 West Forty-seventh Street.

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**Spirographs or Nasal "Breath Pictures."** WYATT WINGRAVE, *Lancet*, Jan. 26, 1907.

The practice of testing nasal potency by breathing upon a prepared surface is by no means new, but its usefulness has been somewhat restricted by the want of a satisfactory material. Slate, glass and polished metals all have their shortcomings, but I have now found that vulcanite, with a medium polish, gives a very reliable and faithful image. By placing the plate horizontally on the upper lip half an inch from the nostrils and giving one short and steady expiration a well-defined steam impression results, and evaporating affords reliable and striking evidence of the actual and relative patency of the nostrils. The image may be temporarily fixed or rendered more conspicuous for demonstration purposes by lightly powdering it with calcined magnesia or fine starch. Small sheets of vulcanite with a suitable surface and of a convenient size are supplied by the Medical Supply Association, 228 Gray's Inn Road, London, W. C. THOMSON.

## REPORT OF A CASE OF EXTRA DURAL ABSCESS.*

BY CLARENCE PORTER JONES, M. D., NEWPORT NEWS, VA.

Gertrude Norman, a colored girl, aged 20 years, was taken on May 3, 1907, with pain in the right side of the head and chilly sensations; the pain in about two hours becoming distinctly aural. Three days later, immediately after an almost unbearable wave of pain, lasting about two minutes, pus tinged with blood was seen to flow in a large quantity, from the ear canal. Temperature now 103 degrees F. per os. On advent of the pus-flow, she became much more comfortable, temperature became a degree and a half lower in a few hours.

I saw her on the morning of the fourth day after the initial attack. There was at that time an opening in the drum sufficiently large to permit of free drainage; a thin greenish pus, slightly blood-tinged, was coming from the middle ear, also there was some swelling of the skin lining the upper posterior auditory canal wall. There was marked tenderness on pressure over the tip of the mastoid process. Temperature 100° F. per os, tongue foul. A simple cleansing solution was ordered to be applied warm, by means of a sterile medicine dropper, as follows:—fill the ear canal, then gently compress the bulb of the dropper so as to cause the fluid to run back and forth up and down the barrel,—the patient lying on the opposite side. This method is practiced till the ear seems clean, which may take several minutes, is repeated every hour during the day, and at three-hour intervals during the night. In intervals between cleansing the patient was told to lie on her back. A brisk mercurial was given, and sulfonal to induce sleep. The next day the temperature was 101° F. per os, tenderness over the whole mastoid, swelling of the soft parts, distinct pitting on pressure. There was sagging of the upper posterior canal wall to such extent as to make inspection of the drum well nigh impossible.

Operation was advised, but advice on this matter was promptly refused by the patient. She had had an abscess opened by a surgeon about two years prior to this, from which she suffered much pain, thus causing a morbid fear of operations. She was healthy and robust, and other than the simple abscess just men-

*Read before the Seaboard Medical Association of Virginia and North Carolina, Norfolk, Va., December 18, 1907.

tioned, she had never had an illness. Her condition remained about the same—discharging greenish, blood-tinged pus, with small pieces of bone, tenderness and pitting on pressure over the mastoid, temperature from one to three degrees above normal and subjective pain. This last symptom became so unbearable that she at last, on the 24th of May, twenty-one days after onset, consented to operation. Accordingly, I sent her to the Dixie Hospital and operated just as soon that day as the arrangements could be made.

The whole mastoid was broken down from antrum to tip into one large cavity, whose external wall, or cortex, was as thin as an egg shell, being easily penetrated by the gouge without the use of a mallet. The cavity, as well as the middle ear, contained pus of the same general character, small pieces of bone, gritty in appearance and debris. The ossicles were gone. Through the roof of the antrum there was a circular opening about three-eighths of an inch in diameter leading to an abscess in the middle fossa of the skull—an extra dural abscess. Sufficient of the skull wall was removed to make a thorough exploration for the purpose of confirming the diagnosis. The abscess cavity was large enough to contain two and a half drachms of pus. The cavity, as well as the whole wound, was irrigated with hot salt solution, and packed with iodoform gauze, in long strips.

The temperature for the next twelve days after the operation averaged 99¼° F. per os, varying from normal to 100½° F. per os. On the third day after operation meningeal symptoms, as headache, restlessness and delirium, developed. The wound was then dressed, and some more pus, about a drachm, came from the abscess cavity. The same flushing and packing was employed as before. The next day there developed complete paralysis of the external rectus muscle of the right eye. The patient became wild at times, worse at night. The bromides, opium, chloral and hyoscine were tried to no avail. After five days of suffering, antipyrine, ten grains, and soda, fifteen grains, were given every six hours. The headache, delirium and restlessness disappeared as if by magic. Whenever there was the slightest headache, even after the patient was up and about, one of these powders would relieve it.

On June 6, the temperature suddenly rose to 103° F. per os late in the afternoon. The next day in dressing the wound, the patient for the first time complained of much pain on pulling the gauze from the abscess cavity, it being to all appearance clean. I did

not repack the cavity. The temperature from this time on remained normal (reaching normal in about twenty-four hours), and healing was most rapid. She left the hospital on June 13. The paralysis of the external rectus muscle of the right eye did not wholly disappear till the latter part of July, sixty days after its appearance. As a tonic and alterative strychnine and syrup of the iodide of iron were given from one week after operation till the last symptom had disappeared. She is now perfectly well.

The case presents several points worthy of note:

*First*—The risk run by her obstinacy; she refusing operative treatment for so long a period while continually suffering with unmistakable symptoms of mastoiditis.

*Second*—Paralysis being confined to one cranial nerve, the right sixth. According to Toldt's Anatomy, this nerve at a point in the middle fossa, for a short space, pierces the dura, and is protected by none other structure than its sheath. Thus any pus which may gravitate here may set up a neuritis, causing paralysis from pressure of a swollen sheath, impairing the function of its fibers.

*Third*—The good effects obtained by the use of antipyrine and soda in treating cerebral congestion,—when other drugs had failed. I have since tried these drugs in conditions where a depletion of the cerebral capillaries is to be desired with most satisfactory results.

*Fourth*—The irritating action of the packing in the abscess cavity after the discharge had ceased; as exhibited by a rise of temperature on June 6, thirteen days after the operation; and its prompt return to normal upon abandoning the packing. Likewise the rapid healing.

118 Thirty-second street.

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**Case of Acute Suppuration in a Thyroid Adenoma Due to the Bacillus Typhosus.** F. F. MELANDRI and T. P. LEGG, *Lancet*, Jan. 25, 1908.

The case is described by the title. Acute abscess of the thyroid is not a very common occurrence, and when it does occur, apart from traumatism such as puncturing a cyst, it is more often observed in connection with an acute febrile tissue, and generally at a late stage of the illness. THOMSON.

## A REPORT OF THREE CASES OF LARYNGEAL GROWTH REMOVED BY DIRECT LARYNGOSCOPY.*

BY JOHN MCCOY, M. D., NEW YORK.

In a certain proportion of cases the removal of a laryngeal growth by the indirect method, i. e., laryngeal mirror and down curved forceps, is accomplished with comparatively little difficulty. There is, however, a proportion of cases in which this operative procedure is not only difficult of accomplishment, but is also at times dangerous to the vocal structures of the larynx. In this latter class of cases the comparatively recent method of attacking the growth directly through a straight tube has yielded me such excellent results in the way of precision and accuracy of removal, that I feel justified in reporting three such cases that have come into my practice during the past six months.

*Case I.* In November, 1907, Mr. K., age 54 years, was referred to me with the history that he had been hoarse for three or four months, that he had lost several pounds in weight, and that a physical examination had failed to reveal any apparent cause for this latter condition. On examination of the larynx a growth was seen projecting from the inner surface of the left cord. The growth was about half the size of a pea, and was attached by a broad base to the mid portion of the cord. It was pale pink in color, as was also the mucous membrane of the cord surrounding it. The necessity of removing the growth was urged in view of the possibility of malignancy. Three careful attempts on three different occasions were made to remove the growth by the indirect method. The patient, however, was so extremely nervous that the minute he saw the forceps going into the mouth, his pharynx would contract and he would grasp my hand. The third attempt was a repetition of the first and second; training seemed to be of no avail. The patient himself then asked if there were not some way in which the operation could be done while he was asleep. The direct method was suggested, and to this he readily assented. He was sent to the New York Eye and Ear Infirmary on November 10. That afternoon he was given a preliminary hypodermic of morphia, gr. ¼, the larynx was cocainized, and he was then placed under chloro-

*Read before the Section on Laryngology and Rhinology of The New York Academy of Medicine, April 29th, 1908.

form anaesthesia. The straight laryngeal tube was then passed into the pharynx and the epiglottis was hooked forward. The instrument used was the separable speculum of Dr. Jackson, as it possesses a leverage bar which makes it easy to bring the larynx into line, and easy for the assistant to hold it there. The growth was readily seen, and about half of it accurately cut away with a long, straight cutting forceps. An unlooked for contingency then arose. Although the anaesthetic used was chloroform, there was an excessive bronchorhea, and when this became tinged with the blood from the wound, it clouded the field of operation as well as the lamp in the tube, and caused delay in removing the rest of the growth, during which the patient partially came out from the anaesthetic and had to be re-anaesthetized. This complication, therefore, interfered with the rapid progress of the operation. It was finally controlled by the hypodermic injection of atropia, gr. 1-100. The operation was then completed by the accurate removal of the rest of the growth in another bite of the forceps. Examination of the growth showed that it was benign in character, a fibroma. The patient's voice was quite restored, and he has reported to me every three months since, to see if there is any indication of recurrence. There has been none, however, and examination to-day reveals a slight thickening at the base of the original growth.

*Case II.* Mr. S., age 20 years, was on February 25, of this year, taken to the University Bellevue Nose and Throat Clinic, by his physician, who gave the history that the young man had been growing increasingly hoarse for the past three months, his general health was good, and he thought he had gained some in weight since his hoarseness began. The doctor and another physician had given him a thorough physical examination, and could find nothing abnormal in the lungs or elsewhere. Examination of his larynx proved to be somewhat difficult, as he had a short overhanging epiglottis which almost completely hid his larynx from view. This combined with a nervous timid disposition, rendered a view of the larynx quite difficult. On deep inspiration, however, one could see a growth in the interarytenoid region, which quite prevented an approximation of the cords. This was considered a good case for the direct method, and it was adopted at once, as it was felt that it would be a loss of time to attempt the indirect method in this timid shrinking lad, with the anatomical obstruction above mentioned. He was placed in the New York Eye and Ear Infirmary,

and on February 26, he was operated upon. He was given a preliminary hypodermic or morphia, gr. ¼, this time, combined with atropia, gr. 1-100. His larynx was cocainized and chloroform anaesthesia was given. The straight tube was passed to the larynx and an excellent view obtained. A good sized growth was seen in the inter aryrenoid region, extending from just below the cords to the upper limit of the larynx. It was pale in color, and papillary in appearance. It was removed, piece by piece, with the straight forceps. The difficulties encountered in this case were that the patient seemed to come out from deep anaesthesia very quickly, and would commence to struggle. This necessitated some delay in getting him well under again. Also he did not seem to the writer to bear the combination of the two depressants, chloroform and cocaine, very well, as evidenced by a pulse which was more rapid and weaker than it should be, and by an unhealthy bluish color of the skin. These symptoms, while not alarming, were not reassuring. Examination of the growth showed it to be a hypertrophic tuberculosis. The young man was advised of the nature of his trouble, and told also that in all probability there was a small focus of the same nature in the lung. He at once took advantage of an opportunity that he had to go to Denver, and I think that he has at this early stage, a very good prospect of complete recovery.

*Case III.* On March 20, a young lady, age 24 years, was referred to me with a history of hoarseness extending over two months. In all other respects her health was perfect. Examination of the larynx showed a circumscribed thickening at the base of the left arytenoid. As she was extremely apprehensive, and very much averse to any instrumentation for the purpose of removing the growth, the direct method under anaesthesia was suggested, to which she readily assented. She was placed in the hospital, and on March 21, was given a hypodermic of morphine and atropine, the larynx was cocainized, and she was placed under anaesthesia. In this case ether was used, and given to complete anaesthesia. The straight tube was passed, an excellent view of the larynx obtained and the growth removed with absolutely no inconveniences or interruptions whatever. The atropia seemed to control the secretions from the bronchi, as there was no bronchorhea. The patient was at all times in perfect condition, and the operation was ideal from the operator's point of view.

After removal of the growth the arytenoid cartilage seemed to be unduly large, and the possibility of a chondroma was thought

of. The examination of the specimen obtained showed it to be chronic inflammatory thickening. The patient has been kept under observation, and as her voice is quite restored, and no difficulty with the cartilage has developed, it is to be presumed that she is cured.

In conclusion the writer would draw the following inferences:

That in a phlegmatic patient this operation could readly be done with the use of cocaine only.

That in nervous, sensitive patients anaesthesia is to be preferred.

That ether anaesthesia is to be preferred to chloroform because of its greater safety, and because the patient once under the anaesthetic remains so a longer time, and therefore gives us a better chance to finish our operation without interruption.

That a combination of morphine and atropine is a good preliminary injection, as the atropine seems to control any tendency to excessive bronchial secretion.

157 West Seventy-third street.

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**Open Safety Pin in the Œsophagus of a Child Aged Five Months.**

J. S. MANSON. *Lancet*, Jan. 4, 1908.

A male child, aged 5 months, was admitted to the Oldham Infirmary on October 26, 1908, with a history of having swallowed a safety pin one hour previous to admission. A skiagram was taken and the pin was seen to lie about the middle of the oesophagus, open with the point upwards. It seems a hopeless task to try to get the pin up by means of a probang, so it was resolved to push the pin down into the stomach and hope for the best. An ordinary stomach tube of small size was pushed down the oesophagus, and after withdrawing another skiagram was taken showing the pin lying in the stomach. The child was kept in bed and watched carefully. Milk diet was given, and four days after admission a dose of castor oil. On the afternoon of November 2nd the pin was found sticking half-way out at the anus. The pin took six and a quarter days to accomplish the journey from the mouth to the anus, and only once or twice did the child seem at all fretful. The case seems worthy of note in showing the power of the alimentary canal in dealing with a foreign body of a somewhat formidable nature. THOMSON.

## CONGENITAL DIAPHRAGM OF THE LARYNX.

BY GOTTLIEB KIAER, M. D., COPENHAGEN, DENMARK.

This case of congenital diaphragm of the larynx is of interest because of its rarity. Altogether only eighteen cases have appeared in the literature, although Turhelle published the first as early as 1869 (*Berlin klin Wchnschr,* 1869, No. 50, page 547); Harmer (*Wien klin Wchnschr,* 1902, No. 46, page 1217), is the only one who has observed the formation by section. Of course, the very common cases, mentioned by Schroetter (*Vorlesungen uber Krankheiten des Kehlkopfes,* 1887, page 239), in his lectures, where the anterior commissure instead of forming a sharp angle, is transformed into a little bow.

The congenital diaphragm is located, as a rule, in the most anterior part of the rima glottidis. Only three cases are reported where it took its origin from the anterior surface of the wall of the larynx at the level of the vocal cords, Chiasi's (*Wien klin Wchnschr,* 1897, No. 25, p. 607); Fraenkel's (*Deutsch Med. Wchnschr,* 1902, No. 51, page 909), and Harmer's Turhelle and Rosenberg (Heymann's Handbuch der Laryngologie and Rhinologie, Bd. I., page 523, 1898); have had each one case, where, in addition to the membrane in the rima, another was seen above this. It is remarkable that the diaphragm is so very rarely discovered at autopsy. Probably this is due to the manner in which the larynx is examined, namely, by splitting it in the anterior midline from below upward, by which procedure the membrane was overlooked when situated anteriorly and seen only when it occupied the exceptional position extending from the back wall.

Nothing certain is known about the cause of this condition. Scipet (*Berlin klin Wchnschr,* No. 2, p. 24, 1889) supposed that it was due to a hypertrophic chorditis vocalis occurring in intraterine life; but almost all observers believe that the cause must be sought for in an adherence of the normal epithelium of the inner part of the larynx. Something like this is seen in the duodenum where epithelial occlusion is found normally at a certain stage of development and where congenital occlusion of the bowel is met. (Tandler, cit. by Fein, Der Angelborene Kehlkopfdiaphragma, 1904.) One thing, however, is certain: there can be no question of a simple reforming of a binding web from the epithelial mass.

The patient is a woman, twenty-six years old, strongly built, of healthy appearance. According to her mother, she has been hoarse from birth. At the age of five years, she had typhoid fever; the next year she had croup, with slight stenosis. She has six brothers and sisters, all sound.

She came to me in October, 1905, on account of hoarseness. The voice is hoarse, without tone, and cannot be reinforced by energetic effort. She whistles well and has cultivated this gift especially as she cannot bring forth a single singing tone. On going upstairs quickly, she becomes short of breath, although she can ride a bicycle without difficulty.

Externally the larynx is perfectly normal. Laryngoscopy shows a normal mucous membrane without scar or thickening. Extend-

ing along the vocal cords there is visible a thin, grayish white, slightly glistening membrane without vessels. It occupies the anterior three-fourths of the rima glottidis, ending behind with a sharp, concave edge. The diaphragm is thinnest in the middle and behind where it becomes very thin and filmy, but at the sides, and especially at its attachment in front, it becomes more fibrous. The vocal cords are seen distinctly as two whitish flat bands with rounded edges. During deep inspiration, they are abducted to their full extent, lying close against the wall of the larynx. During intonation, the membrane disappears, the vocal cords, approximate themselves closely, but gape slightly posteriorly. No other abnormality is seen.

*Operation.*—By the galvano cautery, the diaphragm was cut through in the middle line from behind forward. At first the web was easily burned through, but quite close to the base anteriorly it grew very tough and thick, much more so than I had expected. Immediately after the operation the voice was unchanged, but the patient was astonished by the great amount of air she was suddenly able to draw into her lungs. During the days following,

there was some reaction. Daily applications of menthol in oil were made.

Three weeks later the patient had to return home. She was advised to take frequent deep inspirations and to apply to a physician. She did not follow the latter advice, and the next year paid another short visit to Copenhagen. The vocal cords then appeared to be connected in their anterior third by a grayish white membrane, with a concave free edge behind. The voice was the same as before the operation.

The question is whether we have to deal with a congenital or acquired diaphragm, as either may be located at this place between the vocal cords. The acquired, due to ulcerative processes of typhoid, syphilis, tuberculosis, scleroma and diphtheria, and following tracheotomy in children, never has the perfectly regular structure which distinguishes the congenital, where the vocal cords are freely movable and can be abdicated to the fullest extent without losing their symmetry, as in this case. Moveover, nowhere did the mucous membrane of the larynx show signs of erosion. Everywhere it was smooth and normal. The statement of the mother that the voice was hoarse since birth, only further confirms the diagnosis.

During intonation the diaphragm disappeared, the vocal cords pushing themselves over it like two flaps, which is explained by its wedge-shape. The appearance of the membrane was very thin and filmy behind, more dense and solid in front. On cutting through it, the knife passed through the posterior portion very easily, but the extreme anterior part was thick and tough. The diaphragm is, therefore, wedge-shaped, with a broad base in front, a plane superior surface and a strongly concave inferior surface. During intonation the current of air passes easily backward between the free parts of the vocal cords without pushing the membrane up. This explanation does not always suffice as in the thirteen cases collected by Fein. The result of treatment, with regard to improvement of voice, was negative. As frequently happens, there was reformation of the diaphragm, beginning in the anterior commissure. The result might perhaps have been better if the treatment with Schroetter's Bougies could have been carried out. In the perusal of the literature, one very often sees that the result of protracted treatment shows small return for the effort. One is almost tempted to advise against all treatment in those cases where the only aim is improvement of the voice.

## CONGENITAL DETACHMENT OF FAUCIAL PILLARS AND ISOLATION OF PALATO-GLOSSUS MUSCLE.

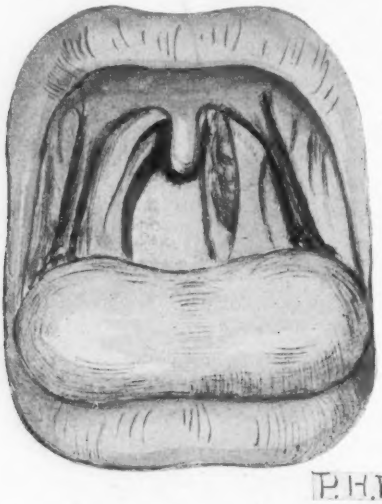
BY PERCY FRIDENBERG, M. D., NEW YORK CITY.

Clefts and fissure formations of the soft palate are, as is well known, frequently a result of destructive changes accompanying inflammation during childhood or of specific syphilitic ulceration later on. Similar defects in the faucial pillars, especially those of a bilateral and symmetrical arrangement are almost invariably congenital and correspondingly rare. The unusual character and infrequency of the structural anomaly indicated by the title suggested the report of the following case:

Arthur K., aged twenty-one years, consulted me for the relief of nasal obstruction and other symptoms which were found to be caused by a marked and irregular deviation of the nasal septum. In the course of a routine examination, inspection of the oral cavity revealed the striking picture which is represented on the accompanying illustration after a sketch from life, and which may be described as follows: Besides the single large central entrance from the oral to the pharyngeal cavity bounded by the pillars of the fauces, and representing an isthmus, there are two smaller lateral openings, like arcades, through which the side walls of the pharynx can be plainly seen. These openings are bounded laterally by the side of the mouth and gullet with normal mucous membrane, and medially by what appears to be a supernumerary anterior faucial pillar running from the lateral margin of the soft palate to the posterior portion of the tongue on either side, and entirely free of the oral or pharyngeal wall. This pillar contains muscular tissue, as is evident from its change of form and size on gagging and voluntary movement of the tongue and soft palate, and in form suggest a tackle or rope. Back of these rope-like structures the usual pillars appear. The posterior pair are rather rudimentary, approach nearer the median line than in normal cases, and appear to be adherent to the wall of the pharynx. The anterior pillars, too, are separated by an appreciable space from the lateral wall of the pharynx, so that they appear displaced inwards, and the isthmus faucium is markedly narowed. There is no sign of a tonsil on the right side. On the

*Read before the Section on Laryngology and Rhinology of the New York Academy of Medicine, April 29, 1908.

left, it is rudimentary.* With the exception of some adenoid hypertrophies in the vault, and the deviated septum already noted, there are no abnormalities in the upper respiratory tract. There is absolutely no disturbance of function which could give rise to complaint on the part of the patient. It is noticeable, however, that the voice has a decided nasal twang, and that certain consonants have the metallic timbre usual with cleft palate. This is quite naturally explained by the incomplete closure of the nasal space from the buccal cavity on phonation, due to the accessory openings on either side which cannot be obturated by the base of the tongue.




In this way a rhinolalia aperta, of very unusual origin is produced. Similarly, in an attempt to inflate the middle ear by Politzerization, air is blown out from the nares into the buccal cavity through the arcades.

A search of the literature shows that the condition described is a very rare one. Symmetrical clefts or split-formations in the pillars have been reported by a number of authors, but a condition quite analogous to that presented by my patient I have not found on record. The basis of such a congenital anomaly must be sought in the embryology of the pharynx. The investigations of His and others

*It is worthy of note that the patient has congenital amblyopia of the right eye, and heterochromia of the irides; the right being hazel, while the left is light blue.

have shown that the second (hyoid) and the third (thyro-hyoid) pair of cephalic visceral or branchial arches (Schlund-boegen of German authors), or pillars bounding the primitive gill clefts, coalesce at an early period of foetal life to form the palato-glossal fold or anterior pillar and the plica triangularis with the tonsillar sinus. A failure of these two structures to unite would produce just such a clinical picture as that presented by my patient, i. e., a supernumerary anterior pillar, independent of the lateral wall of the pharynx and of the tonsil, and running free to the usual insertion near the base of the tongue on either side.

It has occurred to me that the developmental arrest here noted may have its prototype in some lower forms of mammalian or even more primitive vertebrate life, as the piscine or reptilian, representing a form of recession or atavistic survival. Prof. Bashford Dean, whom I questioned on this point, was kind enough to give me the facts in the matter, which appear to show that there is no normal paradigma for this occurrence in lower animals. The soft palate or velum is found in mammals, the uvula in primates, only.

Of the fairly numerous publications under the title of congenital defect of the faucial pillars, reference to the original papers shows that only three cases, those of Wolters, Solis Cohen and Brockaert were at all like mine The others, notably six cases reported by Boucheron, and referred to by Newcombe, were cases of cleft palate with adenoids, defects of the velum (Fincke, Lefferts), perforation due to syphilitic or diphtheric ulceration (Newcombe), unilateral defects which may or may not have been congenital (Morrice, Schmiegelow, Newcombe, Jurasz, Garel, Meijes), split-like opening or fissure in one or other pillar (Rethi, Herzfeld, Hajek, Claiborne), fistula of tonsil (B. Fraenkel), or small symmetrical lacunae, generally oval and measuring about one and one-half cm. by three-fourths cm. (Toeplitz, Chiari, Newcombe), or admitting the tip of the little finger (Schapringer).

Wolter's case, published in 1859, is the earliest of which I can find any record, and antedates that of Chiari, referred to by a number of authors as the first, by over twenty years. It is strikingly different from the cases just reviewed, and the changes are shown in an illustration. The patient was an adult male, aged twenty-two years. The whole anterior surface of both tonsils was exposed, the place of the anterior pillar being taken by a cord-like structure on either side, running from the uvula symmetrically downward and outward to the lateral margin of the base of the tongue.

The posterior pillars were intact, the mucous membrane everywhere smooth and of normal color, and there was no trace of scars. Wolters says that the rope-like structures were simply the isolated palato-glossus muscles.

Brockaert, too, describes his case, that of a boy of eleven, as a true separation (véritable isolement) of the anterior pillars and gives an excellent illustration of the condition. The tonsils were rudimentary, but there was no sign of previous ulceration in the pharynx or pillars. The defect or lacuna in the anterior palato-glossal arch was oval and measured 14 mm. by 3.5 mm.

J. Solis Cohen's case, a man of forty, is the third of this sort, and was published under the title of "Case of Separate Investment of the Palato-Glossi Muscles," which describes the condition very well. The opening in the anterior pillar was about one inch long and narrow, but the lower end of the anterior pillar had a normal insertion and there was no indication of the accessory rope-like structure running to the base of the tongue. The inner and slender boundary of each abnormal opening was the main free portion of the palato-glossus muscle on each side respectively, the investment of the muscle being separate, instead of forming part of a continuous palatine fold.

These two cases resemble mine very strongly in the extent of the "defect" in the anterior pillar, amounting in all three to a real isolation or separate investment of the palato-glossus muscle, but there is an additional feature which distinguishes them both no less sharply from that described above I refer to the fact that my case shows a complete separation of both anterior and posterior pillars from the lateral wall of the pharynx, producing the arcades at either side and causing the isthmus of the fauces to have three openings into the pharyngeal cavity. As the lateral openings cannot be closed by the base of the tongue, the interference with phonation, already explained, is a characteristic symptom in this case which differentiates it from all those found in literature. In fact, Fincke (l. c.) erroneously gives the presence of disturbances of deglutition and phonation as an important differential diagnostic point in favor of previous inflammation and as proof positive that the defects were due to perforating ulceration and not congenital.

As to the explanation of the developmental anomaly, there has been much confusion. Most of the observers have contented themselves with the indefinite assumption of arrest of development, embryonic defect, or with some rather vague generality about bran-

chial arches and gill clefts. Schmiegelow likens these defects to lacunae in the diaphragm, cribriform hymen, and developmental arrest in similar membranous structures, without giving any clear idea of their mode of development in the faucial pillars. Any logical explanation of this anomaly must, as a matter of course, be based on the study of the normal embryological development of the buccal cavity and pharynx, more particularly of the base of the tongue, and, above all, of the palato-glossi muscles in man and lower animals. An analogy might be found at some point in the series in the form of normally separate palato-glossi or accessory pillars.

Chiari considers the factor of a persistence of the branchial clefts in the causation of these symmetrical defects of the pillars, and notes that congenital branchial fistulae open at the base of the tongue on the lateral wall of the pharynx, but that the absence of any pouch or canal in connection with the defects precludes explanation based on this hypothesis.

Schapringer, whose patient, a woman of twenty-six, showed traces of a hare-lip which had evidently been healed during foetal life, believes that at some future time the explanation of these congenital defects will be given by comparative anatomy rather than by embryology.

60 East Fifty-Eighth Street.

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**Tuberculous Adenoid Vegetations With Demonstration of Koch's Bacillus.** Dr. ROSSI-MARCELLI, DE NAPLES. *Ann. des mal. de l'oreille*, 1894.

A young man of 17, without hereditary taint and with sound thoracic and abdominal organs, was found to have adenoid vegetations of large size. Small portions of these were removed and submitted to the microscope, and were found to be one mass of tubercles. A bacterioscopic examination showed the presence of Koch's bacillus in all parts of the preparation. SCHEPPEGRELL.

## REPORT OF THREE UNUSUAL CASES OF NASAL DISEASES.

BY G. C. HALL, M. D., LOUISVILLE, KY.

While for the proof of most things a series of cases is desirable, or even necessary, it is often not within the scope of the individual worker. To those of us especially who live away from the larger centers of population, it is not given to see a great many of the unusual cases; however, it seems to me that we are none the less liable, for the failure to report such cases, even if a series is impossible.

It is this consideration that prompts the report of the following cases, which, though of varied conditions, hold something of peculiar interest to the Rhinologist, either on account of the novelty of the conditions or the unusual manifestations presented.

*Case* 1.—*Septal resection complicated by Syphilis.*

G. F., age 30, white, male, married. Occupation, blacksmith. Patient was referred to me by Dr. Ira S. Kerns of this city for nasal examination. April 24, 1907, patient's general health was good, though he had lost some weight in the last few months. His trouble began eight months previously with a "cold." He had lost his sense of smell completely, so was not conscious of any odor from the discharge of the nose. The patient complained of the discharge both from the nose and in the throat, that he continually had a "cold" and breathed at all times through his mouth, which was dry and foul every morning; that he had a dry cough, except in the morning, when for an hour or more he coughed up "lumps of sticky mucus." He also spoke of headaches, which commenced directly above the root of the nose and radiated to above the ear, worse on left side. The patient also complained of epistaxis, sometimes severe, which would come on especially while shoeing a horse or working over the forge, and during the examination, the tissues were prone to bleed at the slightest instrumental interference. The patient had no history of being a bleeder.

Examination revealed a nose absolutely blocked up. The inferior turbinates were engorged and inspection was impossible beyond the vestibule. The surfaces were moist and covered with a thin watery mucus. Shrinking with suprarenalin-cocaine showed the turbinates hypertrophied. The septum was irregularly deviated and in the neighborhood of the anterior ends of the middle turbi-

nates bulged out on both sides, coming in contact with the turbinates.

The patient, on being questioned closely in regard to a possible fracture of the nose, then remembered that several years previously, while "breaking" an unruly horse, he had been struck violently in the nose by the horse throwing his head back. This evidently accounted for the thickened irregular septum.

The nose was next carefully examined for pus at the openings at any of the sinuses, and the frontal sinus and antrum were examined by trans-illumination, but showed clear. The symptoms and examination both pointing to the left side as the worse, I decided to remove the left inferior turbinate which was very much hypertrophied, both to relieve his respiratory distress and to gain room for further operative procedures. This was done April 27, 1907, under cocaine and suprarenalin. The patient stood the operation well. There was no pain or hemorrhage. The packing was removed on the second day and a paraffin splint inserted which was worn ten days, the patient meanwhile attending to his work. The splint was then removed and nasal respiration was possible for the first time in eight months. This splint was described by Dr. Moraweck and myself in an article in the *Journal of the A. M. A.*, February 24th, 1906.

Though the patient was in every way improved, his symptoms still persisted, though in a mitigated form. Accordingly, on June 8th, I did a subperichondrial resection of the septum. As before the patient stood the operation well, though it lasted nearly two hours, the membrane being adherent over the irregular areas, which evidently corresponded to the lines of the old fracture. The quadrilateral cartilage was infiltrated with lime salts, and had almost the consistence of bone.

The after treatment was uneventful, and the wounds were healing kindly with only the slight crusting that follows the operation, when, without apparent reason, the septum began to thicken. It became very red and angry looking, and encroached on the nasal chambers making nasal respiration very difficult again. Pain on the left side of the head again became severe, and the patient complained that he felt as though he had a cold all the time. He had profuse discharges at irregular intervals of thick yellowish mucopus, after which he obtained some relief from the head pains. I carefully searched for involvement of the sinuses without result. I ran the gamut of local and general treatment, and even advised a

change of occupation in the hope of bringing relief; he having told me that he was compelled to work in a draught.

At every visit it was the same old story. Nose stopped up, discharge, pain in the head. The patient's general health was also affected, he having lost over ten pounds in weight. The most minute inspection failed to reveal the slightest cause for the now distorted and thickened septum.

The patient denied syphilis, and a thorough examination of his entire body also failed to discover any evidences of the disease.

This state of things continued up to the first of September, when I saw far up on the right side of the septum a minute spot of ulceration. Scrapings failed to reveal tubercle bacilli, so I at once cauterized the spot with acid nitrate of mercury, and put him on large doses of bichloride of mercury and iodid of potash, with orders to report any trouble by phone and return in a week.

September 8th. Patient returned much improved. No pain since last visit. No discharge. Nose open, he can breathe through it at all times. Septum becoming normal.

September 22d. Septum normal. No ulceration or thickening in median line. Ample space in both chambers. No discharge. No pain in head. Patient's general health improving, and he is gaining rapidly in weight.

September 29th. All symptoms in abeyance. Weight continues to increase. Mercury began to affect mouth, dose was reduced.

November 23d. No recurrence of symptoms. Patient continues to improve. Treatment continued. This was then a manifestation of syphilis in the nose. It might be pertinently asked where did it come from. The man has a wife and children who show no signs of the disease, nor aside from the nose has he ever manifested any.

Another interesting question also is how long it will be advisable to keep this man under treatment, and it is one I cannot satisfactorily answer at present. The case gave me an infinite amount of worry and trouble, and I believe it worth recording.

*Case 2. Septal resection complicated by antral suppuration.*

This is submitted as a preliminary report on a subject which I shall report more in detail later on. It apparently demonstrates that, notwithstanding the fact that though both membranes were perforated and a portion of one lost during a subperichondrial resection of the septum, such a condition does not necessarily result in a permanent perforation. As this case healed successfully in

spite of very adverse conditions, namely, the presence of a suppurating antrum on the right side, I trust the method herein described may prove the solution of this unfortunate complication, and that by such a procedure as I describe, perforations arising from the operation may become a thing of the past.

Clinical History. C. K., age 27, white, single. Occupation, clerk. He has had trouble with his nose since a child, following an attack of scarlatina. For the last few years it has been worse. There is a muco-purulent discharge from the nose, worse on the right side, which discharges pus with an offensive odor. The sense of smell is impaired. Pain at times under right eye, worse in damp weather. There is some cough, and the voice is husky at times, due to irritation to the cords by the discharge passing to the throat.

He was hit on the nose by a ball some years ago and since that time the nose has been turned to the right. After the accident the right side of the nose was completely blocked and a specialist of this city removed some polyps and a bone, according to the patient's story. There was, it seems, no effort made to locate the source of the pus. No farther treatment was given. Pus, odor, pain, etc., still continued. The general health was affected but little, if at all.

An examination August 31 revealed the following: Tip of the nose is bent to right. Right side of the nose was completely blocked by the deflected septum, which extended over to the lateral wall. The mucous membrane was bathed in pus which discharged freely.

The deflection extended well into the bony portion and was displaced from the ridge below, the lower part of the septum being in the right nostril, while the maxillary ridge projected upward in the left as an irregular bony ridge. The left nostril was spacious on account of the deflected septum, but the turbinates, especially the inferior, were hypertrophied.

Transillumination showed the right frontal sinus and antrum dark, the left clear. Tenderness on pressure on the right side was well marked. As treatment failed to influence the symptoms on the right side and as access to the sinuses was impossible, I determined to correct the septum in spite of the pus. Accordingly on September 29 I did a subperichrondrial resection of the septum, working from the left side.

The operation was long and difficult and the removal of the maxillary ridge caused sharp hemorrhage. I commenced my in-

cision in the mucous membrane far back, curving upward as I reached the tip, so as to more effectually remove the ridge. Above, the membrane separated very easily on the left side, but despite the most careful dissection the membrane was perforated on the right side opposite the incision so that a through and through perforation existed, which bid fair to become permanent. In fact I informed the patient at the time that I thought in all probability such a permanent opening would be established. After the deflection was removed I smoothed out the edges of the wound and applied compound tincture of benzoin over the incision. Gauze strips were then packed on both sides of the nose. Considerable reaction followed the operation, but subsided after 48 hours, when the packing was removed. Our paraffin splints (See *Journal of the A. M. A.*, February 24, 1906) were then inserted on each side to maintain pressure and furnish support.

These splints were changed every three or four days and kept in place over two weeks. Notwithstanding the perforation on the right side and the continual flow of pus, which bathed it from the diseased antrum, it healed kindly and today not a suggestion of a perforation exists. This is the first case of this nature in which I have ever kept the splints in for so long a time and I feel amply repaid for so doing. I shall keep a strict account of similar cases and will report them whether I succeed in preventing the perforation or not. While puncture of the opposite side is a thing to be avoided, it will occur in a certain percentage of cases and I would recommend this method to operators who experience this complication. I would be glad to furnish information as to the splints and the method referred to, to anyone to whom our article is not accessible. I would also feel indebted for case reports, whether failures or successes, after employing this method.

*Case 3. A Large Naso-Pharyngeal Polyp.*

This case is of interest on account of the mistaken diagnosis and the number of operations the patient was forced to undergo without any relief. The history is as follows: E. E. Von R., age 35, white, male, married. Trouble with the nose had existed for years. The left side was stopped up at all times. On forced inspiration a small volume of air could be obtained, but on expiration the stoppage was absolute. This, it seems, would have been sufficient to have made a diagnosis, though it was apparently not considered seriously in his previous operations, nor by myself during the first operation.

He was operated on first in 1892, in Butte, Montana. The inferior turbinates were cauterized with the galvano-cautery and the tonsils removed. This, however, did not clear up the trouble on the left side of the nose. In fact the patient thought he slowly became worse. Nothing more was done for several years, when the patient consulted an eminent rhinologist of Chicago, who removed the adenoids and snared off the posterior end of the inferior turbinate. These procedures likewise failed to relieve his trouble and the chiseling of a bony spine off the posterior portion of the septum was advised and declined, the patient being about to leave Chicago. He consulted me on October 10, 1907. Examination of the nose showed a thin, narrow nose, small nostrils. Right side of the nose free, turbinates not engorged. Left side of nose apparently free along the inferior turbinate except for a small projection on posterior portion of the septum already referred to. However, it was possible to look beyond this to what was apparently the posterior wall of the naso-pharynx.The middle turbinate on the left side was enlarged and pressed for its whole length against the septum. It was practically impossible for him to blow the left nostril, though a fair amount of air could be taken in on inspiration. An examination of the throat revealed the remains of tonsils now submerged, with diffuse redness over the whole pharynx and a granular condition of the posterior wall. An examination of the naso-pharynx was attempted, but it was impossible to use a mirror, as the slightest attempt caused retching. I therefore refrained from inserting my finger in the naso-pharynx out of consideration for the feelings of the patient, and there is where I made a serious mistake, for I feel, had I done so at the time I would have saved the patient an operation and its attendant inconvenience.

He came to have the spine on the septum removed, but I assured him that this could hardly be the sole cause of his difficulty and advised the resection of the middle turbinate.

On October 15 I removed the middle turbinate and the bony spine on the septum with very little trouble and the patient was able to blow his nose at the conclusion with comparative freedom, though not without effort. I was puzzled at the time, but thinking that things would right themselves I did not proceed farther, but packed the nostril as much to prevent adhesions as to control hemorrhage. After twenty-four hours the packing was removed and a long paraffin splint inserted. This of course necessarily prevented very free respiration on that side so that the result of the

procedure was in doubt. However, on removal of splint his condition was very little if any better than before. After waiting several days with no improvement I again thoroughly cocainized the nose, on October 26, for further operative procedure, as I supposed an adhesion between the posterior part of the septum and the inferior turbinate had taken place. Careful inspection of the now shrunken nasal structure failed to reveal any adhesions and I inserted my finger into the naso-pharynx for a possible solution of the difficulty. On the left side my finger encountered a large, smooth, soft mass, the nature of which I was unable to determine, but which was attached to the outer wall of the naso-pharynx. I want to confess that even at this point I did not suspect the large solitary naso-pharyngeal polyp as being the cause and can only plead in extenuation that two other good men had likewise failed to discover it. My attention was now directed to the examination of the nose and I now discovered that what I had taken for the posterior wall of the naso-pharynx was the anterior surface of this growth.

The difficulty of examining the naso-pharynx and the fact that the growth moved when the patient said "K" or "cuckoo," led me into this error. On passing a thin-bladed instrument through the nose for the purpose of determining the extent of attachment of the growth, it was dislodged and fell into the pharynx and so out of the mouth of the patient, much to his delight and with entire relief of all his symptoms.

The growth was pear-shaped and measured ten millimeters. It was evidently freely movable and by its valve-like action completely blocked the left side on expiration, but by falling into the naso-pharynx permitted a small amount of air to pass on inspiration.

The growth had evidently been present for years and should have been discovered long before it was. However, I take no credit to myself, but feel that it taught me a lesson that I shall not soon forget.

Gaulbert Bldg.

## A FOREIGN BODY EXTRACTOR.

BY CHEVALIER JACKSON, M. D., PITTSBURG, PA.

Soft foreign bodies, like dried uncooked beans and peas, roasted peanuts and like substances that are liable to crush under forceps, present difficulties in bronchoscopic extraction; and a number of fatal cases of failure, of attempted removal of such substances have been reported. No attempt at forceps extraction is justifiable.

For such bodies I have devised the instrument shown in the illustration. The spoon-shaped extremity is passed below the foreign body, then the spoon is turned at right angles by the handle mechanism, and the intruder withdrawn into the bronchoscope, as will be understood at a glance.

The illustration is actual size, except as to length.

430 Park Building.

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**Non-Tuberculous Intra-Nasal and Post-Nasal Abnormalities; Their Regarded Association with Tuberculosis.** W. C. RIVERS, *Lancet*, Dec. 28, 1907.

This is a plea for a more complete investigation of nasal obstruction and catarrh as a predisposing factor to pulmonary tuberculosis.

THOMSON.

# SOCIETY PROCEEDINGS.

## NEW YORK ACADEMY OF MEDICINE.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

*Regular Meeting, April 29, 1908.*

WOLFF FREUDENTHAL, M. D. Chairman.

PRESENTATION OF PATIENTS.

**Congenital Detachment of Faucial Pillars and Isolation of Palato-Glossus Muscle.** By PERCY H. FRIDENBERG, M. D.

*Published in full in this issue of* THE LARYNGOSCOPE, *page* 567.

**Congenital Atresia of the Pharynx.** By S. OPPENHEIMER, M. D.

The patient, a young woman of twenty, first came under observation a year ago, complaining of suppuration of both middle ears, and obstruction to respiration. The obstruction dated back seven years and the difficult respiration as far back as she could remember. The anterior nares showed a general condition of congestion. Inspection of the mouth showed adhesion of the posterior faucial folds to the posterior pharyngeal wall and a small opening about the size of a dime situated directly back of the of the uvula. The causation of her otitic condition was self evident. Dr. Oppenheimer said that he had seen several such cases, one congenital, the others following specific disease, five in all. Two were submitted to operation. In the congenital case an attempt was made to separate the membranous attachment from the post-pharyngeal wall, but the result was unsatisfactory.

The specific case was also subjected to operative interference and an obturator fitted in to keep the parts separated, but the result in this case also was unsatisfactory. Other cases operated upon by other men have been rather unsuccessful. The present case was shown to-night for the purpose of eliciting a discussion as to the most satisfactory means of operating upon this trying condition.

DISCUSSION.

DR. J. E. NEWCOMB said that up to 1897 he had found forty-two cases reported. Particulars were given in only thirty-one instances. Of these, twenty-five were splitting of the anterior pillars or the isolation of one or both and six of the posterior. One

of the peculiarities of these cases is the almost invariable rudimentary character or absence of the tonsils. Just what the cause of this is no one seems able to demonstrate. About the only symptom complained of is that there is a little pocketing of the food in the recess caused by this peculiar condition. The term used by Dr. Friedenberg—the separate investment of the palato-glossal muscle, is undoubtedly the best descriptive term. Three cases formed the basis of the paper referred to. One was that of a woman with a specific lesion who applied for treatment, and the progress of the destruction could readily be traced; the tonsilar tissue had sloughed away and left the anterior pillar isolated. We are still very much in doubt as to the cause of this condition. Some have looked upon it as the persistence of the original bronchial clefts, but from the view-point of the embryologist there seems to be reason to think that that is not the best explanation. The French anatomists regard the condition as due to embryonic absorption of tissue which has been previously formed. During the last fifteen or twenty years, during which there has been such activity in reporting unusual cases, many more of the class under consideration have gone on record. Dr. Newcomb has made records of all such reports since the date of his own article on the subject and has found thirty articles during the last eleven years.

Dr. Berens said that the late J. E. Nichols in the Transactions of the American Laryngological Association for 1906 had described an operation for the relief of this condition of atresia. The operation secured fairly satisfactory results in that a fair amount of breathing space was secured. The operation consisted in passing a seton through the telum at its attachment to the pharyngeal wall, bringing it out in the median line and tying it. This is repeated on the opposite side. The setons were made of heavy silk plaited, at least one-eighth inch in thickness. He allowed them to remain in for six weeks, and then cut through the portions of the velum included in the ligatures—in other words, performed the old-fashioned web-finger operation. He had seen several cases and was able to follow them and most of them did well. In his own experience he has had seven or eight cases, and the majority have done well, but one or two were complete failures. He felt that he could advise the operation, with considerable hope of relief.

Dr. Emil Mayer said that his experience in this class of cases of atresia of the larynx was limited to the specific ones and these

had been benefitted by the use of specially fitted hard rubber tubes made to bend at right angles, of various and increasing sizes.

These the patient soon learned to introduce and in time a large opening remains sufficient for the patient's comfort.

DR. FREUDENTHAL said that he remembered Dr. Nicholl's paper very well, and had his instruments. Something similar was advised by a German writer, who, after separating the adhesions introduced gauze through the nostrils and brought it through the mouth. Then he tied it firmly and claimed to get very good results. He had meant to try this on a patient who was in the hospital, but the patient left before the operation could be done.

DR. LEDERMAN said that he had seen described a similar operation to that described by Dr. Nichols, in which rubber bands were used instead of silk that cut through gradually by their contractile action. If a fair sized rubber ligature was employed, it was possible to obtain quite an area of separation.

It was a necessary step in the treatment of pharyngeal adhesions to continue the separation of the raw surfaces until all ulceration or the granulating wound had healed.

PRESENTATION OF PAPERS.

**The Treatment of Fractures and Depressed Deformities of the Nose by a New Method with the Use of a Combined Bridge and Intranasal Splints.** By W. W. CARTER, M. D.

*To be published in full in a subsequent issue of* THE LARYNGOSCOPE.

DISCUSSION.

DR. HARMON SMITH said that the last case referred to by Dr. Carter had come more directly under his observation than the former, and upon that case he would state his observations. He thought the outcome more satisfactory than one had reason to expect when the unusual conditions existing at first, were fully appreciated, and he thought the operator certainly deserved to be congratulated upon the outcome.

The mechanical appliance presented seemed to meet many of the requirements that had been needed for a long while, but he thought it unwise to form a definite conclusion as to the efficiency of an instrument upon its application to one case.

The method pursued in this case resulted satisfactorily; but he believed that the infection of the skin would occur in some cases from passing the sutures from the nasal cavity through the skin over the nose.

He also thought that the mucous membrane flap was unnecessary to the outcome of the operation and only complicated it. He believed that even had it resulted favorably it would not have materially influenced the outcome. The full appreciation of the mechanical advantages of the instrument could not be seen until it was properly adjusted upon the nose with the supporting sutures in place. The pressure given laterally by this appliance was just what was wanted in these cases.

Dr. Berens congratulated Dr. Carter on the results obtained with the instrument, though of course it was still too early to say what would be the final result after cicatrization and contraction takes place in the case the nasal processes of which were entirely gone, the nasal processes have evidently been raised, and they have been raised so far—judging by the picture—that there must be still an interval of soft parts between the fragments and the superior maxilla. Whether these soft parts will ossify or will contract remains to be seen. The instrument will be of great aid in supporting the bony arch. He thought there was little risk from infection by the silk ligatures and most of this danger could be obviated by the use of a little collodion.

Dr. McCoy said that he had not seen Dr. Carter's cases, but that he had read the paper before the meeting, and thought the doctor was to be congratulated on the long stride forward that he has made in devising this apparatus. The treatment of these cases resolves itself into the treatment of recent and old fractures, where one has to go into the nose and rearrange the structures. Dr. Carter had spoken of the impossibility of passing a splint through so as to support the bridge, because the vertical diameter at the entrance is so much smaller than it is one inch further in the nose.

That is quite true when you speak of solid objects for splints.

It has not been Dr. McCoy's practice to use solid splints of that character, but to pass into the nose small strips of gauze thoroughly impregnated and covered with bismuth subnitrate. These are packed from the arch down until midway of the nose is reached, and then a splint is put in to allow the patient to breathe through the nose. He had treated many cases of both recent and old fractures by this method and had found it quite satisfactory. The results were very good, though perhaps not so good as those shown by Dr. Carter to-night. In the old cases seen by Dr. McCoy, most of them had been fractured rather from the side of the nose, causing a fracture which is compound, i. e., through the mucous mem-

brane and possibly the septum as well is fractured. Adhesions form between the nasal bone and the septum of the injured side and frequently there are adhesions on the other side. These are the most difficult kind of cases for submucous operations because of the adhesions on both sides. In old fractures he had tried something which he thought was new. Instead of using the Adams' forceps or hammer and chisel, he used a forceps with a very long handle and a small but firm grasping end. When the nose was entered with the forceps the forceps was placed on a horizontal bar and the patient's head held very firmly, now working the long handles by force of leverage he was able to break up the arch. He had used this method in five or six cases of old fractures. In some this instrument would not break down the nasal process of the superior maxilla, as the force was not sufficient, but in the other cases the results were extremely satisfactory.

DR. MYLES said that he felt impelled to add a word of commendation. Dr. Carter had undoubtedly made a proper application of the rules of mechanics, and it was only a question of experiment as to the usefulness of the instrument. The operation is done for cosmetic purposes, and the risk of injuring the face by infection or suppuration has always to be considered. Dr. Myles said that he has seen a great deal of Dr. J. O. Roe's building work of this character, and some of it had produced very remarkable results. It is still largely a question of experiment.

DR. CARTER, closing, said that he appreciated the manner in which the instrument had been received by the members and hoped that it would prove of benefit to the profession. He regretted that he had not enough cases to-night to present a conclusive demonstration, but he felt that the instrument was devised on strictly mechanical lines, and the construction of an arch was a question involving mechanics also.

In regard to the sub-mucous work, Dr. Smith did not seem to think very much of it and the results in this case would not lead one to think there was much in it but it was a very unfavorable case for sub-mucous work—one of the worst atrophic cases he had ever seen; but he felt convinced that the operation would prove of service where there was a healthy mucous membrane and tissue to work upon. The height of the septum must be increased in order to raise the dorsum, and this operation offered an opportunity for doing this without leaving a perforation in the septum.

Dr. Berens had spoken of the interval between the fragment and the nasal process of the superior maxilla. Of course, there is connective tissue between, but the process of ossification is so rapid here that bony union could be confidently expected. He did not think that Dr. Beren's suggestion with regard to collodion at the exit of the suture would be of benefit, for safety lies in the drainage by capillarity along the suture. He had noticed that if a scab is allowed to form there was a tendency for a litle pus to form around the suture. It should be kept perfectly clean with peroxide of hydrogen.

Dr. McCoy's suggestion of a more powerful instrument for breaking the bony arch was a good one.

He hoped that Dr. Myles would find the operation satisfactory. He believed that the mechanical principles involved in the apparatus were correct and that in using it there is not the slightest danger of increasing the deformity.

**The Drainage Mechanizm of the Normal Accessory Sinuses.** By S. YANKAUER, M. D.

*Published in full in this issue of* THE LARYNGOSCOPE, *page* 518.

DISCUSSION.

DR. MAYER said that he had followed Dr. Yankauer's experiments with great interest and agreed with him in the conclusions drawn. The writer had presented in an entirely new manner some novel theories and these helped to explain some reasons for the difference of opinion which some of us had as to the particular origin of sinus disease.

It seemed reasonable to accept the explanations given and the action of the ciliary bodies within the cavities of the accessory sinuses was not the least of these.

Another important fact is the rising of the fluid in narrow spaces instead of following the law of gravitation.

We thus can understand how fluid pours out of a cavity from a point higher than its base.

These interesting experiments will enable us to make our diagnosis with more unanimity and we will perhaps agree as to the source of disease in a particular cavity.

DR. FREUDENTHAL said that the action of the ciliary bodies as presented by Dr. Yankauer seemed quite natural, and appeared to be similar to that of the bronchi. The action of the latter was thoroughly studied by Professor F. Gaule of Zurich—they swing

upward and bring forward everything that is in their way. He would like to know if Dr. Yankauer had made any studies on the ciliary bodies of the nose. He would also like to have Dr. Yankauer explain his remark about cold and dry air making the mucous membrane swell. According to his own clinical observation dry air does just the contrary—that is, when a person is exposed to it for any length of time.

Dr. Myles congratulated Dr. Yankauer upon his valuable contribution to this subject. For many years he himself has been studying these phenomena, some of which have puzzled him. Of course, the action of the cilia has always been recognized. They are the chief factors for bringing forward the secretion to the outlets; and this has been one of his chief reasons for not over-curetting the diseased mucosa, especially in the antrum of Highmore. His own explanation has been that the too and fro motion of the air during expiration draws the long continuous stream of the secretion out of the sinuses, and if one blows some powder on the inferior turbinal below the hiatus semilunaris one will notice that it moves backward, forward and downward.

The secretion of the frontal sinus, in diseased condition has always been a subject of great interest and he had sought for an explanation of the morning pain which becomes easier in the afternoon. The conclusion which he had reached was that the thick mucus gravitates to the opening of the naso-frontal duct when a patient is in the upright position and the gas forces it through and causes the pain in transit.

He has often noticed the condition referred to by Dr. Yankauer —the travelling upward of the secretion. There is no doubt of this; it will travel up from the middle meatus, between the middle turbinate and the septum against gravity. Dr. Yankauer had made some very interesting observations. Many are puzzled at times to determine definitely the sinus or sinuses from which the secretion comes. He had spent several hours watching their hiati, wiping them out, and trying to understand many of the phenomena of which Dr. Yankauer had spoken of to-night, and had so well explained by his physical demonstrations.

Dr. Freudenthal said that he would like to mention that inhalations could not be considered a valuable diagnostic aid. He had used them often to cause a headache to disappear when the headache was due simply by a post-nasal catarrh. However, they were not a diagnostic sign for accessory sinus trouble.

DR. YANKAUER said—speaking in regard to the effect of the inhalation of dry air upon the turbinals—that it was a fact that when the air is cold and dry the turbinals swell. Of course, the cause to which Dr. Freudenthal probably had reference was the continued inhalation of such air for a long time—he had referred to the immediate effects. The turbinals react with great promptness to changes in the heat, cold and dryness of the atmosphere. In regard to the test, he had been watching the effect of steam inhalations for many years, and had yet to find a case in which any other kind of headache except one caused by accessory sinus disease or by obstruction to the outlet of the sinus, was relieved by steam inhalation. He had known of cases in which so-called post-nasal catarrh was diagnosed in which one would get such a reaction, but closer examination will show that post-nasal catarrh is the result of sinus disease.

The matter of the test is of interest to the general practitioner, for he will find it a very simple and easy method of getting a hint as to the origin of these cases, particularly those where the patient either has no nasal secretion or is so accustomed to it that he thinks it is only natural and normal.

**A Report of Three Cases of Laryngeal Growth Removed by Direct Laryngoscopy.** By JOHN MCCOY, M. D.

*Published in full in this issue of* THE LARYNGOSCOPE, *page* 560.

DISCUSSION.

DR. YANKAUER said that he himself had begun to do this work with the Kierstein Autoscope for examination purposes. One advantage which the direct method has over the ordinary method of operating upon the larynx is that one can operate under anaesthesia. One cannot use the mirror to advantage under an anaesthetic, but with this method you can operate at your own convenience and with as much certainty as with the usual method. It has, therefore, decided advantages with children. He had in the past year operated upon a case of papilloma of the larynx, in Dr. Voislowsky's service on Staten Island, which was, however, unsuccessful. It was a case of recurrent papilloma, in which a tracheotomy had been done; the larynx was filled with soft masses, and although there was a good view of the larynx, and the instrument could be introduced readily, as fast as the mass was removed more took its place. It was found necessary to do a laryngotomy. The case was entirely unsuccessful, but as far as the technique is concerned the operation was ac-

complished with more ease than it could have been done under the ordinary method. He had removed one or two specimens from the larynx for microscopic examination, under local anaesthesia, but the great advantage of the method is that you can operate under general anaesthesia.

Jackson's instrument has some advantages over Killian's, and the new-shaped handle which Jackson uses is also used in the latest models of the Killian instruments.

Dr. Thurber told of his experience with a very short-necked, thick-set, alcoholic individual, where he had attempted to remove a papilloma by the direct method without a preliminary injection of morphine. The patient took the anaesthetic very badly, and with his short, thick neck, it was almost impossible to get the instrument in the larynx, so the attempt was abandoned, and the papilloma was removed by the usual method the following week. He would be glad to know if others had experienced any difficulty with such individuals.

Dr. Abraham said that he wished to add a word of praise for Dr. Jackson's tubal speculum. He had experimented with Killian's instrument also but preferred Dr. Jackson's instrument for direct laryngoscopy. He knew of no instrument which would demonstrate the larynx so well as Dr. Jackson's. He had not yet operated upon the larynx with it, but saw no reason why this could not be done to advantage. The instrument is an ideal one.

Dr. McCoy endorsed the views in regard to Jackson's instrument. Replying to Dr. Thurber, he said there might be some difficulty in getting such an individual under the anaesthetic but once under its influence and thoroughly relaxed, there would be no more difficulty with such a case than with any other. It is simply a question of getting the muscles thoroughly relaxed.

**Demonstration of Instrument for Opening the Frontal Sinus Through the Nose.** By S. Yankauer, M. D.

Dr. Yankauer demonstrated an instrument for this purpose.

## THE AMERICAN LARYNGOLOGICAL ASSOCIATON.

*Twenty-ninth Annual Congress. Washington, D.C., May 7 to 9, 1907.*

A. W. DEROALDES, M. D., President.

(*Continued from the June Number, page* 512)

**A Case of Bilateral Abductor Paralysis of the Larynx.** By CHARLES H. KNIGHT, M. D. (Read by Title).

(*Published in full in* THE LARYNGOSCOPE, *September, 1907, page 685.*)

**Ligation of the External Carotid Artery, Considered from a Rhinological and Pharyngological Viewpoint.** By CHEVALIER JACKSON, M. D. (Candidates Thesis).

After attributing the belief that this operation is a serious one to the impression created in preaseptic days, the author goes on to give the indication, mortality and technic of the operation, closing with reports of a few illustrative cases and a summary of his thirty-eight cases.

The indications of interest to the rhino-pharyngologist are, severe hemorrhage after tonsillectomy and intra-nasal operations, as a preliminary step in the removal of fibromata and angiomata of the rhino-pharynx, and in malignant disease in the external carotid area, the maxillary antrum, the nose and naso-pharynx.

The mortality taken from all sources is two to three per cent. In Dr. Jackson's thirty-eight cases nil. He attributes this in part to his care to ligate as far as possible above the bifurcation.

For the performance of the operation a few suggestions are offered after reference to the classic description. An ample incision is advised to avoid any risk of mistaking the artery due to an anomalous condition. Local anaesthesia should be used if there is the slightest contra-indication to general anaesthesia.

Crile's operation of temporary compression of the common carotid with this surgeon's elaborate apparatus is discussed, and the advisability of the resection of a portion of the arterial trunk, instead of merely ligating it in malignant cases, is pointed out.

**Epithelioma; Total Laryngectomy, Including the Removal of Part of the Trachea; Death from Pneumonia on the Thirteenth Day.** By CLEMENT F. THEISEN, M.D. (Read by Title).

Before reporting this case the author calls attention to the difficulty of obtaining a reliable pathological diagnosis of malignant

disease of the larynx, due in large part to the failure of the surface of the growth to show its true character. This results in delayed operation, and the removal of pieces for examination stimulates the growth.

The operation in this case is described with the accompanying points of interest. The gross and microscopic description of the specimen removed is given in full.

**Sarcoma of the Pharynx in a Child of Eight Years, with Autopsy Finding, and Microscopical Report.** By CLEMENT F. THEISEN, M. D. (Read by Title).

The author presented the report of this case, because of the rarity of sarcoma of the pharynx in young children.

The growth showed as a large mass, involving the soft palate and pushing it forward. It extended downward almost to the epiglottis, and apparently upward into the naso-pharynx. It was firm to the touch. There was some involvement of the glands, particularly of the left side of the neck.

Coley's serum in increasing doses was used for about a month and a half until the death of the patient. For a few weeks the serum injections seemed to be beneficial.

The description of the post-mortem findings, microscopic and gross, are included, and there are two views of the pathological specimens.

The status of the question of treatment for these cases is briefly considered.

**Is There an Ideal Operation for the Correction of Deviations of the Nasal Septum?** By JOSEFH C. GIBB, M. D. (Candidate's Thesis).

The various operations are briefly considered, and the final conclusions are reached that:

(1) There is no single operation devised which will correct every form of deviation of the nasal septum.

(2) The shape and positions of the septum resulting from deviation are so various as to make accurate description difficult, if not impossible.

(3) The object of operation upon the septum should be correction sufficient to restore the normal functions of the nose with as little destruction of tissue as possible.

(4) Each case must be a law unto itself, and studied carefully and in its entirety.

(5) In many cases the object sought, namely, restoration of nasal function, may be attained by the removal of exostosis or enchondroses, and the septum left intact.

(6) Other cases may be corrected by one or other of the older operations, the selection of which depends upon the individual preferences of the operator.

(7) Still others can be corrected by removing the septum entire, according to the submucous method.

**Erysipelas and Its Relation to Purulent Inflammations of the Nasal and Aural Cavities.** By CHRISTIAN R. HOLMES, M.D. (Candidates Thesis).

The rather vague etiology of many streptococcic infections is given as a sufficient cause for careful research into the subject of erysipelas.

The growth of the knowledge of the bacteriology of the subject is traced from the early beliefs up to the present generally accepted statement that the various kinds of streptococci are fundamentally the same and inter-changeable.

A large mass of data has been collected from the literature on the flora of the nose, pharynx and accessory nasal sinuses, and this is given at some length, with the final conclusion that the pneumococcus and streptococcus are the two principal pathogenic bacteria which have their normal habitat in the nose and accessory sinuses.

The author then goes on to connect the relatively frequent occurrence of facial erysipelas with a primary infection in the nose and accessory sinuses. In support of this conclusion he adduces many reports of cases and many authorities. A lengthy bibliography is added.

**Large Tumor of the Laryngo-Pharynx Removed by Sub-Hyoid Pharyngotomy.** By WALTER F. CHAPPELL, M. D.

This tumor in its course first interfered with respiration, and later deglutition. Its growth was slow, and occasioned remarkably little interference with the general health of the patient. It was removed through a transverse incision below the level of the hyoid and through the thyro-hyoid membrane. The pedicle was attached close to the left ary-epiglottic fold. It was tied off with black silk ligature, which subsequently gave trouble. The author concludes that chromacized gut would have been better. The tumor was smooth, irregular in shape, weighed twenty grams after it had been in formation, and four and one-half inches in circumference.

Subsequent to the operation, aside from some difficulty in feeding, with a slight attack of scorbutus, recovery was uneventful.

Eleven similar cases are reported from the literature. Three excellent illustrations accompany the paper.

**The Construction of the Ethmoid Labyrinth.** By GEORGE E. SHAMBAUGH, M. D. (Candidate's Thesis).

This paper consists of a critical study of eight sections taken through the ethmoid labyrinth to discover the relation of the cells of the labyrinth to each other, and to the adjoining nasal accessory sinuses and structures. There are eight illustrations showing these relations.

The growths were very numerous, covering the epiglottis, springing from the region of the ventricles, lining the vestibule of the larynx and covering the cords.

Various drugs were tried in vain, as also systematic removal by forceps. New growths continued to reappear. Finally the application of alum and savin in power seemed to check the growths, which were then removed by forceps. The patient used a strong solution of alumnol as a spray, until the last papilloma had been removed. Recovery has been complete.

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**A Case of Diphtheria of the Skin of Three Years' Duration Treated by Anti-Toxin.** A. B. SLATER, *Lancet*, Jan. 4, 1908.

There seems to be no doubt that the most important factor in this case was the Klebs-Loffler bacillus. The disease apparently commenced as an acute attack of diphtheria, the primary seat of infection being the eyes. From this focus the vulva became infected, and then the bacteria in some way found their way into the superficial lymphatic circulation, producing a condition resembling herpes, probably as the result of peripheral neuritis set up by the bacilli themselves. This theory is based on the fact that during the whole of the duration of the disease, since the primary acute symptoms, the lesions have been confined to the superficial layers of the skin (proved by the fact that no scarring was left). Whether the staphylococci played any important part is difficult to say, but they probably had only a mild influence, if any at all, as the use of various lotions, such as one in 40 carbolic lotion, and perchloride of mercury one in 1,500, had no effect on the lesions, whereas the effect of the antitoxin was remarkable. THOMSON.

**Figure 1.—Vertical section of canal and tympanum, showing definition of epitympanic space.**

**Figure 2.—Antero-posterior section of epitympanum, showing smooth-walled depressions.**

PLATE I.

*Plates to accompany paper of C. J. Blake:*
*"Contour and Contents of the Epitympanum."*
*The Laryngoscope, August, 1908.*

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Figure 1.—Vertical section of canal and middle-ear cavity, exhibiting proportion and relationship of epitympanum to tympanum, with soft tissues in place.

Figure 2.—Vertical section of middle-ear cavity along manubrial line, showing demarcation of epitympanum by horizontal folds.

PLATE II.

*Plates to accompany paper of C. J. Blake:*
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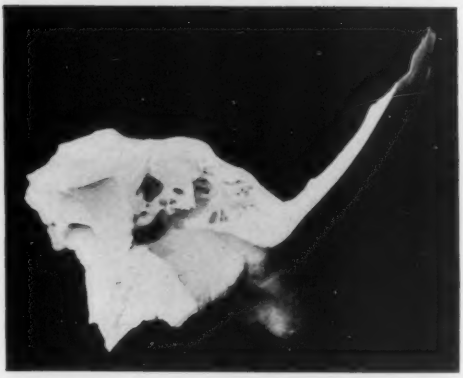

**Figure 1.—Vertical section of an elevated epitympanum bounded externally by large radiate diploetic cells.**

**Figure 2.—Posterior space of elevated epitympanum with large radiate diploetic cells.**

PLATE III.

*Plates to accompany paper of C. J. Blake:*
*"Contour and Contents of the Epitympanum."*
*The Laryngoscope, August, 1908.*

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Figure 1.—Epitympanic space with long transverse diameter.

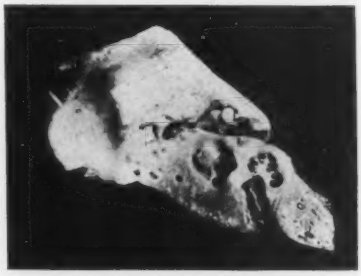

Figure 2.—Horizontal section, displaying recessus incudis and inward curve of antral wall.

PLATE IV.

*Plates to accompany paper of C. J. Blake:*
*"Contour and Contents of the Epitympanum."*
*The Laryngoscope, August, 1908.*

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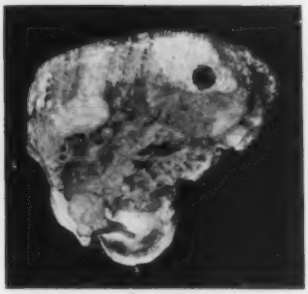

**Figure 1.**—Membrana tympani, malleus, incus and outer epitympanic wall, photographed by transillumination, direct.

**Figure 2.**—Membrana tympani, malleus, incus and outer epitympanic wall, photographed by transillumination from below upward.

PLATE V.

*Plates to accompany paper of C. J. Blake:*
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*The Laryngoscope, August, 1908.*

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Figure 1.—Vertical section exhibiting smooth outer epitympanic wall with diploetic boundary, superiorly and posteriorly, and section of diploetic mastoid.

Figure 2.—Vertical section of large posterior epitympanic space.

PLATE VI.

*Plates to accompany paper of C. J. Blake:*
*"Contour and Contents of the Epitympanum."*
*The Laryngoscope, August, 1908.*

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